SUSTAINABILITY AND THE SMALL CITY:

MUNICIPAL CLIMATE CHANGE ACTION

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George Charles Homsy

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SUSTAINABILITY AND THE SMALL CITY:

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George Charles Homsy, Ph. D.

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Climate change is the most important challenge facing the planet and one of the most interesting common pool resource problems. Since the climate is a non-excludable public good, the fear of free riders should dissuade rational individual municipalities from local action. Indeed, the vast majority of municipalities do not implement climate change mitigation policies.

In the three papers of this dissertation, I examine policymaking in those municipalities that do choose to act on their own. First, I develop a theory of co-production and planning among local governments and across levels of authority that opens up space for examining municipal action on commons issues. I explore the framework among small and rural municipalities using three case examples that illustrate the potential for local action, but present the challenge that polycentric approaches lead to externality problems and require multilevel governance to ensure coordination and compliance.

The second paper uses a survey of 1,841 municipalities to examine the role of state climate action plans and state-to-state regional climate change initiatives in creating a multilevel governance environment conducive to local action. Using a logistic regression model, I conclude that the likelihood of a municipality planning for climate change increases in a supportive multilevel environment with important differences between small and large places.

The third paper uses interviews with leaders in twelve small communities, which are

labeled “unlikely pioneers” because they act on climate change against the odds as calculated in the second paper. This paper examines two theories about local government action on global commons issues: public choice theory, which argues that internal factors drive action, and multilevel governance, which frames policymaking as arising from both internal and external factors. The results show support for both. Public entrepreneurs can spearhead municipal climate policies on their own by reframing global issues with an internal focus, but fiscal capacity limits response. Multilevel governance is found in places with municipally-owned utilities, which face top-down regulation. However, these municipalities have access to a stream of revenue from the utilities that enables more sustained climate change mitigation programs.

BIOGRAPHICAL SKETCH

George Homsy received his Bachelor of Science in Engineering Psychology from Tufts University in 1986, but went straight into journalism with a focus on the environment. He co-produced radio documentaries for Interlock Media Associates and was a studio production engineer for WBUR, the National Public Radio (NPR) affiliate in Boston. In 1990, he and colleague Steve Curwood co-produced four pilots for a public radio series on the environment called *Living on Earth*. The next year, they started producing the radio newsmagazine for weekly distribution on NPR. After almost ten years at *Living on Earth,* George left to co-found and produce *The Cultivated Gardener* with Michael Weishan, which aired for a year on public radio stations across the country. George also did freelance writing. His clients included *Planning* and *Tomorrow* magazines as well as NPR, CBS Radio's *Osgood Files*, and *The Boston Globe*.

In August 2004, George earned his Master of Regional Planning degree from Cornell University. In January 2005, he was a planning consultant with the firm, Saratoga Associates, based in Saratoga Springs, New York. George spent almost five years helping municipalities create environmentally and economically sustainable communities.

Building on this experience, George returned to Cornell University in 2009 to study for his Ph.D. in the Department of City and Regional Planning. In addition to his research, George served one year as treasurer of the Cornell Association of Ph.D. Planners and one year as a member of the department's curriculum committee. During two summer festivals he also rowed for the Sibley Dragons, the department's dragon boat racing team.

In August 2013, George joined the faculty of Binghamton University's Department of Public Administration as an assistant professor to help create a new Master of Sustainable Communities degree.

DEDICATION

I dedicate this to my family. All of them have been supportive and have stood with me through the various celebrations and tribulations of my life, including my Ph.D. education.

Sarah Louise Homsy, my mother

Samuel Homsy, my brother

Elizabeth Homsy, my sister-in-law

Matthew, Hannah, and Ian, my nephews and niece.

I love you all.

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Professor Steven Wolf of the Department of Natural Resources served as the second member of my committee and pushed me theoretically harder than anyone else. Though at times I struggled, his efforts instilled in me the importance of strong theory as a guide for my research. Associate Professor Stephan Schmidt of the Department of City and Regional Planning helped me think about translating urban policy frameworks into smaller municipalities. He also pushed me to teach a comprehensive planning course at Cornell, which proved an invaluable experience.

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Finally, I must acknowledge and thank my Ph.D. cohort: Silvano De La Llata, Ashima Krishna-Jayant, and Sheryl-Ann Simpson, as well as the candidates in the years ahead of me and the students that followed. Some say that earning a Ph.D. is a lonely experience. My years at Cornell University were anything but lonely thanks to these people (and their partners) who have become lifelong friends.

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INTRODUCTION

> *You know that the action today is in cities. You want to save the world? You start saving it in cities… We will save the world one plan at a time, one initiative at a time, one strategy at a time, but make no mistake, we will save the world.*
>
> George Heartwell, mayor of Grand Rapids, Michigan[1]

Mayor Heartwell's confidence in local governments echoes research and practice literature in which municipalities are viewed as the leaders of sustainability and climate change action. After the first Rio Earth Summit in 1992, hundreds of municipalities took up the charge of sustainability called for by the United Nation's Agenda 21 (Yanarella & Levine, 2011). In the U.S., and in the absence of strong national leadership, some public officials have proposed innovative sustainability plans for the largest urban areas (Young, 2010).

Municipalities are an important component of the ability of national governments to meet climate change goals (Bulkeley & Betsill, 2003) and have been the focus of greenhouse gas mitigation policy since the late 1980s (Bulkeley, 2010). Local government was discussed as an important actor in the 1987 *Brundtland Report* and at the first Earth Summit in Rio de Janiero in 1992 (Bulkeley & Betsill, 2003). During the closing decade of the 20th century, pioneering municipalities, such as Toronto, Newcastle, Heidelberg and Munich, developed climate change action plans that evolved largely from existing energy conservation efforts (Bulkeley, 2010). Transnational networks helped these global cities to adopt greenhouse emissions targets, climate change mitigation plans, and implementation policies (Schroeder & Bulkeley, 2009). The first

[1] Mayor George Heartwell spoke on a panel about climate change at the 2013 Mayors Innovation Project conference in Washington, DC on January 15, 2013.

decade of the 21st century saw a second wave of municipal action that encompassed a more diverse set of cities including smaller municipalities and those from the developing world (Bulkeley, 2010). Hoffman (2009) describes this increase in municipal climate action as the emergence of a shadow system of climate governance that encourages experimentation and fosters policy specialization at the local level.

Research finds cities responsible for 50 to 75 percent of carbon emissions (Satterthwaite, 2008; Stern, 2006) and local governments have the capacity to reduce those emissions in a number of ways. Compact residential development, which municipalities can control through zoning, leads to 20 to 40 percent less driving (Ewing, Bartholomew, Winkelman, Walters, & Chen, 2007). Research in Virginia suburbs finds that requiring denser single-family housing patterns can reduce greenhouse gas emissions from building heating and cooling by five to nine percent annually (Pitt, 2013). Chicago neighborhoods with 33 percent tree cover reduce emissions due to air conditioning by 3.2 to 3.9 percent per year – a figure that could have been much larger but for the city's relatively short cooling season and the substantial amount of nuclear power generated electricity (Jo & McPherson, 2001). Boston plans to require energy efficiency upgrades to existing buildings when they are sold; a move that the city expects will reduce emissions by seven percent by 2020 (Lubber & Hunt, 2010). Today municipal solid waste accounts for four percent of greenhouse gas emissions nationwide and advances in technology and practice (especially increased recycling, composting, and energy recovery) have cut emissions by 85 percent from 1974 to 1997 (Weitz, Thorneloe, Nishtala, Yarkosky, & Zannes, 2002). In addition, the close connection that cities have with businesses and residents makes them an important educational actor and possible role model for non-governmental entities (Collier, 1997).

Despite such potential most municipalities do not act on climate change (Conroy & Iqbal, 2009; Saha & Paterson, 2008). According to a 2010 national survey, only 12 percent of municipalities have created a baseline of emissions or set reduction targets; 22 percent have sought to reduce energy use in municipal transportation fleets and outdoor light fixtures; only five percent offered energy audits to private businesses (Svara, 2011). While several hundred municipalities of all sizes have created and adopted climate change action plans (Boswell, Greve, Seale, & Mroz-Barrett, 2011), there are tens of thousands of local governments in the United States and the vast majority do nothing. For most officials, integrating global concerns into municipal management is a difficult task (Bai, 2007) and prospects for scaling up the number of local governments who act is uncertain (Hoffmann, 2009).

The problem of urban policy theory and climate change

Urban theorists largely break down into two camps (A. Harding, 2009). Public choice advocates seek to explain the ways in which people sort into groups and neighborhoods with a spatial version of economic utility-maximization as the mechanism. Community power theorists put decision making at the core. In this section, I briefly review the literature around the contemporary economic and power theories of policymaking. In all cases, the theories of municipal policy emergence focus on internal factors, such as public service delivery, taxation, and other quality of life and economic issues. With local leaders responsible to local voters, municipalities become institutional actors without much incentive to protect common pool resources, such as the atmosphere, unless such action results in a local benefit.

Public choice theory is an economic theory of urban politics. In his famous essay, "A Pure Theory of Local Expenditures", Tiebout (1956) described a normative model of

policymaking centered on the citizen as consumer. People would choose their community of residence based upon the degree to which a municipality satisfied the consumer's demand for particular public services. Policy development is based on the notions of individualism, instrumentality, and rationality and is modeled on economic markets (Christensen & Laegreid, 2002; O'Flynn, 2007). Intermunicipal relations are based on competition as local governments pursue economic development projects in order to enlarge the tax base, often at the expense of their neighbors. Critics argue that public choice theory makes huge assumptions about the services available, the information that citizens can access, and the true mobility of people, who are typically constrained to a particular locale by proximity to work, cost of housing, and location of family (Oliver, 2001). The role of power is absent; residents are simply consumers who create policy by voting for leaders (Gendron & Domhoff, 2009). Yet powerful actors often frustrate voters. For example, development interests regularly succeed in pushing projects ahead despite citizen preferences to the contrary (Siskind, 2006).

Similarly, *growth machine theory* emphasizes competition with other municipalities in order to secure economic growth. However, in this case a coalition of powerful of stakeholders drives an economic development agenda (Molotch, 1976). This growth imperative limits the ability of other social or environmental initiatives to take hold. Local leaders rise to power by sharing in the economic development vision of the community and, often inadvertently, produce policies that harm the environment.

Urban regime theory focuses on a coalition of local government officials and private interests with the latter providing the resources to implement a joint program (Stone, 1993). The regime model builds on the notion that government has the responsibility to implement policies, but lacks the capacity to accomplish its entire agenda. The municipality forms a public/private

governing coalition from which it can draw the resources. Unlike the growth machine, business interests alone cannot control urban policies, but must work with diverse partners (Stone, 1989). Although economic growth is often central, the need to put together a coalition means other priorities can be acted upon (Mossberger, 2009).

Policy entrepreneurship is a theory of action by local leaders who recognize and seize opportunity for change in a community (Page, 2006) by harnessing a changing flow of events (Stone, 1993). Schockly (2008) adds the notion that entrepreneurship serves an equilibrative function that restores stability to a policy regime. Entrepreneurs are not sole actors as other levels of government may create opportunity through regulations, funding programs, or other incentives. Local citizens, who might be particularly interested in, educated about, or politically disposed to an issue may also contribute to the formation of an opportunity.

Different entrepreneurial actors have different motivations (Schneider, Teske, & Mintrom, 1995). Political entrepreneurs (e.g. mayors) often emerge out of advocacy over issues such as pro- or anti-growth, concern over services, tax levels, or budgetary crisis. Some come from the business community and seek to establish policies benefiting that constituency. Bureaucratic entrepreneurs (e.g. city managers) are driven by the desire to achieve specific policy goals, solve problems, and serve the public. Managers' performance also helps them compete for better positions in larger communities. City managers are often innovators, and while they must navigate local politics, they also reach beyond to test innovations that have been vetted by their professional associations. Entrepreneurs must hold together coalitions of supporters by emphasizing the collective mission and vision. In order to be successful, they must broaden the range of options that people in the community consider and reframe choices in order

to break through existing routines and lead people to challenge the status quo. The difficulty in making change is often used as an excuse to protect power or avoid conflict (Galston, 2006).

Urban social movement theory understands change as brought about by actors seeking to impact popular consciousness (Fainstein & Hirst, 1995) by framing issues to mobilize a constituency, transform bystanders into supporters, exact concessions from targets of the movement, and demobilize antagonists (Rabrenovic, 2009). Recent coalitions have come together to support planning and equity policies, especially those aimed at alleviating urban poverty (Pastor, Benner, and Matsuoka, 2009). For example, a citizen movement in Los Angeles forced government leaders to provide better public transit to inner city minority neighborhoods (Grengs, 2002). However, activists can also pursue strategies that work against environmental or egalitarian outcomes (Fainstein & Hirst, 1995).

These theories appear to have very different forces driving action, but they share an inward focus on changing local conditions, which is usually short-term given election and budgetary cycles. These theories struggle to find a motivator for action on issues of the regional or global commons, unless there is a direct connection between cost and benefit (E. Ostrom, 2010). As described by my results in chapter four, many pioneering communities find ways to internalize local benefits of climate change action. However, none of the communities acts alone, instead interacting with other municipalities, levels of government, and/or non-governmental actors, often for technical expertise or fiscal capacity. Power, capacity and coordination are common challenges.

Feiock (2004) offers institutional collective action (ICA) as a theoretical framework to account for municipal cooperation, especially on issues of the regional commons. When the spillover benefits of collaboration outweigh the transaction costs of forming new institutions,

communities have the incentive to achieve joint goals through voluntary agreements and associations on issues of economic development, environmental protection, or other public goods. Such voluntary collaboration among municipalities is at the core of co-production and communicative planning as it involves broadening the perspectives represented, increasing the number of options, fostering ownership of policies, and developing more comprehensive solutions (Forester, 1999; Innes, 1996; Innes & Booher, 2003).

However, this framework of voluntary regionalism by intermunicipal bargaining falls short without an organizing structure. Voluntary deliberations by individuals to reduce negative externalities require that parties have complete information and property rights be easily definable (Coase, 1960). Voluntary bargaining among municipalities is often not successful given power differences (Warner, 2008). The number of municipalities that can engage in the negotiation is limited by the need to build trust and accountability among partners (E. Ostrom, 2010). Often a trained facilitator is needed to establish the conditions that lead to successful outcomes, especially on complex issues (Innes, 2004). In the United States in the area of environmental protection, the federal government usually imposed top-down regulations that eliminated the need for bargaining among local governments to protect a common pool resource. Such systems work for some issues, but as problems and solutions become more complex, this one-size fits all strategy becomes less effective (Fiorino, 2006).

In this introductory chapter I develop a theory of co-production and planning among local governments and across levels of authority that opens up space for examining municipal action on issues of the global commons. This multilevel collaborative framework is key to understanding the importance of local knowledge and policy production around commons issues, such as climate change. In this way I seek to build on the standard theories of policy emergence, which focus on

the importance of local leadership and incentives. To them I add the multilevel nature of governance. This construct provides an opportunity for us to understand local governments not as independent actors in a competitive market, but as part of a complex web in which various levels of government shape local action. My theoretical framework allows for the inclusion of power, which can be examined not only as a force that can lead to inequitable policymaking among bargaining municipalities, but also as a centralized authority that can support, incentivize, and coordinate action. This multilevel governance framework provides for a more robust understanding of the ways in which local governments act, not only around the issue of climate change, but also for policymaking involving commons issues.

Co-production and planning

Theories of co-production and planning travel on parallel and intertwined paths. Co-production is often described as the inseparability of the way we think about nature and society and the way we choose to live in the world (Jasanoff, 2004). Much of the co-production literature seeks to temper the assumed authority of physical science over other kinds of knowledge, especially the wisdom embedded in customs and practices. The same power dynamics typically govern policy development, especially when a centralized authority has goals that require local government action. Co-production, for my purposes, is about knowledge creation and policy development in a manner that understands and includes a range of interested and affected parties.

I conceive of planning as the boundary institution that bridges the "science" and the "civic" as well as the "central" with the "local" – all of which are necessary to create workable policy on complex, commons issues. Planning's main role is not as a political symbol, educational venture, or enabler of the policies of the powerful. Planning, in my framework, co-

produces policy between science and civic, central and local, powerful and weak, and so on. In some cases this might occur within a municipality, for example, among neighborhoods or individual stakeholders. In this dissertation the unit of analysis is the municipality and how each acts on its own or in a multilevel collaboration to mitigate the problem of climate change.

This conception represents a departure from planning's rational roots, which are epitomized by the top-down imposition of vision during the City Beautiful Movement and Urban Renewal and in which the final product (the plan) was crucial. At the same time, I challenge the more process-dominated conceptions of communicative planning that emphasize consensus building. Planning as co-production is a process that results in a plan. This plan serves as a boundary object through which the various involved parties can see their interests represented.

In this section, I first deal with the problems of knowledge production, then I move to the value of co-production, and finally I reach the intersection at which planning becomes the boundary institution (and plans become the boundary objects) that allow diverse stakeholders and perspectives to tackle complex problems (Guston, 2001).

The traditional understandings of knowledge and policy production

The world has never been a simple place, but for thousands of years we probably did not know any better. The rise of the centralized expert began in the period of Enlightenment when such people were granted the authority to shape society through scientific and technological advances (Brand & Karvonen, 2007). This privileged status accorded to science perpetuates the philosophy that there is "one world, one and only one possible true account of it, and one unique science that can capture that one truth most accurately reflecting nature's own order" (S. Harding, 2000, p. 129). With one truth, it flows that there is likely one optimal policy solution to a problem.

More recently, however, as problems in our global society multiply and the growing ranks of stakeholders become more diverse, simple answers are impossible. People continue to harbor ambitions of control, and science increasingly strives to bring that control. But that veneer of power over complex issues simply heightens uncertainty as knowledge is always incomplete (Sarewtiz, 2000). The higher the stakes and the larger the systems involved (for example, the atmosphere), the more uncertainty exists in knowledge and the disputes among stakeholders over values increase (Bäckstrand, 2003).

The production of knowledge has different conceptions. Turnbull (1997) describes a simple dichotomy. There is imperialist science, defined by rationality and methodology with knowledge taking on the imprimatur of a universal truth. And there is local knowledge, which is value laden. Failure to recognize the local, Turnbull claims, makes science hierarchical and exploitative. For example, he says, in Indonesia, the Green Revolution, which had been sparked by western science, turned the nation from an importer of rice to an exporter, but with devastating consequences to the environment including the loss of local rice varieties, a dramatic increase in pests, and the collapse of rice harvests. Such failure often occurs when policymakers do not engage local stakeholders. Instead they create a dynamic of power, knowledge, and action that results in nature or local people "biting back in unexpected ways" (Leach, 2008, p. 1784).

Researchers eventually came to realize that the inquiry into wicked problems is not the scientific examination of facts, but rather "an endless, inconclusive inquiry into alternative possibilities" (Lindblom, 1994, p. 332). The process has been dubbed a "collective experiment" by Latour (1998), who says that science does not bring certainty to issues or order to society. Instead, science adds ingredients to a process. Despite that recognition, the science-policy interface often remains restricted to researchers who simply inform policymakers and

policymakers who view science as technical assistance; citizens act only as the recipient of policy (Bäckstrand, 2003). This raises questions about whether science can live up to its promise to better society (Lemos & Dilling, 2007) and whether policymaking can achieve its goal of being based on evidence (Owens, Petts, & Bulkeley, 2006).

In addition, people are increasingly skeptical of supposed scientific truths and often cannot even agree on the conception of a problem. The gap between knowledge and policy can be due to communication and timeliness of information. With politically charged issues, policymakers may be selective about the knowledge they use, if they use research at all (Owens et al., 2006). Policymakers' perspectives often conflict with resource users' knowledge and social framing (Leach, 2008). The ways that people interact with resources not only color their knowledge creation, but also limit it (S. Harding, 2000). Environmental problems are complex because they involve the interaction of biological, physical, and social systems and require the collaboration of scientists, policymakers, and citizens (Lemos & Morehouse, 2005). Sustainability and sustainable development are contested concepts and for this reason require a more deliberative form of governance (Kemp & Martens, 2007).

Co-production of knowledge and policy

Local knowledge and citizen-based expertise become part of the discourse, not as a public participation exercise, but as a partnership with the policymaker and/or technical analyst. Such democratization offers the most effective path for avoiding disasters, which result from stifling of perspectives (Funtowicz & Ravetz, 1993). Knowledge and policy are embedded in customs, identities, institutions, and other components of society.

To that understanding, I add the notion of engagement, such as described by Bäckstrand (2003), who uses the term 'civic science' to describe a triangle of scientists, policymakers, and

citizens co-producing both knowledge and policy. Knowledge also has three components according to Edelenbos and others (2011), who describe *scientific knowledge* as developed by experts who bring field specific norms, values, and methodologies to a problem. *Bureaucratic knowledge* comprises an understanding of political and administrative processes and stresses the strategic use of knowledge with less of an emphasis on substance. *Stakeholder knowledge* derives from context or location and concerns insights and experiences that come from day-to-day practices and local customs.

Co-production is very concrete as it is both about how people organize and express themselves as well as about accounting for their values and ways that they assume responsibility (Jasanoff, 2004). Local engagement on issues leads to greater acceptance of conclusions (Martin & Richards, 1995) and tends to identify the actors missing from the knowledge generation and policy creation processes (Corburn, 2009). Through an iterative negotiation process between centralized 'expert authority' and local knowledge, culture, and customs, co-production of policy can be more sustainable economically and environmentally (Lemos & Morehouse, 2005).

The drive for a co-production approach can result in the formation of new institutions to handle the incorporation of new knowledge and new technology (Miller, 2004). Cash, et al. (2003) outline three institutional factors that relate to improved co-production. First is communication. Mobilizing knowledge requires active, repeated, and inclusive communication; effectiveness suffers when communication is just one way. Second, mutual understanding is required. This involves eliminating jargon and taking care with language as well as recognizing different experiences of participants. Third is mediation, as increased understanding does not necessarily eliminate conflicts. Overarching frameworks are required to mediate legal, economic, educational, and cultural values, especially when held by those lacking capacity (Saward, 1993).

Boundary organizations can facilitate knowledge transfers, mutual understanding, and generate the boundary objects that can be commonly used by people within the scientific, political, and local spheres to provide stable relations across the boundary (Guston, 2001). Such organizations can be responsive to various perspectives by mediating the shifting domains of the scientist, policymaker, and local stakeholder. For example, the U.S. Cooperative State Research, Education, and Extension Service, in dealing with the depletion of the High Plains Aquifer in the western United States, provided space for long-term relations to develop, two-way communications to be fostered, and the changing interests of various actors at multiple levels and with various degrees of power to be addressed. The service also created agricultural and economic models that served as boundary objects since participants could use them to explore future scenarios from their own perspective (Cash, 2001). The creation of such boundary institutions and objects can produce a highly contested and complicated discourse (Waterton & Wynne, 2004). But the contestation and uncertainty, "as unwelcome as it so often is, opens our eyes" (Maynard-Moody, 1995, p. 18) and generates the vigorous discussion that can lead to a policy response (Corburn, 2009; Forester, 1999). If all of the actors had to agree, nothing would ever get done, vagueness is required, "ambiguity is part of the translation" (Latour, 1996, p. 48).

Sustainability efforts in particular will be more effective when the boundaries between knowledge and policy are managed in a way to improve the relevance, credibility, and legitimacy of information (Cash et al., 2003). Co-produced knowledge must be scientifically valid, relevant to policymaking, and recognized by stakeholders (Edelenbos et al., 2011). In her case study of an interaction between climate scientists and policymakers in Europe, Lövbrand (2011) found a close, but uneasy, relationship between researchers and policymakers in Brussels. Scientists did

engage stakeholders more closely than in typical research efforts and sought to provide information needed for policymaking.

Social learning and the co-informing relationship between nature and society played out in a case study of local planners engaged with federal climate change scientists to devise contextually relevant strategies to combat the urban heat island effect in New York City (Corburn, 2009). Researchers on the team were initially reluctant to work with local planners who lacked a scientific background. However, the local non-scientists had knowledge about the built environment that made the heating model more accurate and more reliable for policymaking. Other stakeholders weighed in, such as the department of transportation with a pavement inventory and the parks department about trees. The various voices led to a more precise policy solution to a complex scientific and social challenge.

This is not to say that co-production policy systems are perfect. Co-production increases the opportunities for innovation and social impact, but can involve enormous commitments of time and personnel (Lemos & Morehouse, 2005). Scientists also found themselves placed in an uncomfortable position between academic freedom and the goal of creating politically salient knowledge that is useful to society (Lövbrand, 2011). Conflicts between expert knowledge and local stakeholder understanding occur due to different perspectives, values, and motivations (Edelenbos et al., 2011). Collaborations fail when one party determines that their best interest is to delay decision making (Kraft & Johnson, 1999). Power is also an important factor that could disrupt collaborative networks (Agranoff & McGuire, 2003; Kettl, 2002).

Planning's role in co-production

Into this world, we insert the planner. Through the 20th century, the phrase "city planning" and more general conceptions of planning have changed. Olmsted described planning

as the "well-considered control on behalf of the people of a city over the development of their physical environment" (Olmsted, 1916, p. 1). Indeed, it is still most often conceived as a rational way of preparing for the future through, for example, the gathering and analyzing of data, the testing of alternative scenarios, and evaluating costs and benefits (Kelly, 2010).

Other people argue for a more process-oriented view of planning (Innes & Booher, 2003). Planning may be the creation of a guide for future action, but it faces a world of conflicting interests and power inequity (Forester, 1989). Results matter, but there is much more to be gained than simply having a plan. Co-production and collaborative planning involve broadening the perspectives presented (Forester, 1999; Innes, 1996; Innes & Booher, 2003). Citizens can make a variety of contributions beyond their local knowledge including ingenuity, financial resources, and political accountability (Fung, 2008). Social psychological literature provides evidence that deliberation can lead to individual and collective benefits (Carpini, Cook, & Jacobs, 2004).

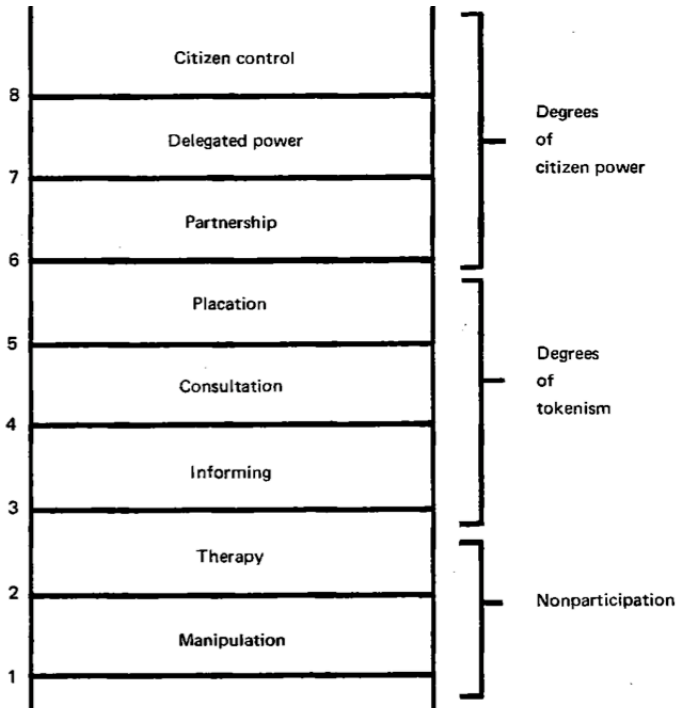
McCrum, et. al. (2009) found that deliberation fosters social learning about climate change adaptation among land managers. In this Scottish case study, deliberative workshops created meaningful interactions and exposed people to a wide variety of strategies. Land managers engaged with scientists as equals and reframed the research into strategies that would suit their particular situations. This reframing helps ease local conflicts and often requires coordination between levels of government (Mendes, 2007). The goal of involving stakeholders is not about finding direct interests and undertaking conflict resolution, but rather about broadening the diversity of values represented in order to ensure that outputs are compatible with wider community interests (Margerum, 2002). Doing so can reframe power relationships within a municipality and can also result in strategies that share benefits (Innes, 1996). When examining

natural hazard planning, Burby (2003) found that broad stakeholder involvement contributes to plan quality and the likelihood of implementation.

Consensus need not be the goal of a planning process. Indeed, Lindbloom (1994) warns that avoiding controversy in the search for consensus is a major impairment of the policymaking practice. Social learning occurs as stakeholders establish the dimensions of an issue and wrestle with various solutions (Collins & Ison, 2009). "Decision making, planning, and participatory processes are dances in which the initially relevant can become irrelevant and the apparently irrelevant can become relevant" (Forester, 1999, p. 135). Bargaining increases efficiency, the acceptance of a decision, and the quality of the decision since the controversy forces an examination of many alternatives (Nutt, 1999) and the messiness can create space for radical solutions (Cochrane, 2010).

Haggett (2009) elaborates on three types of public engagement. The first is simple *information provision*, which can include efforts at education. Often this is an attempt to persuade people to adopt already announced policies and can encourage protest since the opportunity to provide meaningful input was missed for one reason or another. Second is *consultation*, which provides the opportunity for outside voices to shape projects and helps the public support plans. The third form of engagement is *deliberation*. The public does not simply discuss and shape plans crafted by others, but has an active role in developing policies and plans from the beginning. As with more general co-production, this form of engagement is rare and requires a commitment of resources. In his analysis, Haggett has presented a rethinking of Arnstein's (1969) classic Ladder of Citizen Participation. (See Figure 1.) The typology describes eight rungs of participation, which move from non-participation through tokenism to various degrees of citizen power.

Figure 1 – Arnstein's classic Ladder of Citizen Participation



(Arnstein, 1969, page 217)

What then is the role of planning in co-production? Forester (2012) argues that planning must move beyond technical, aspirational, and goal-oriented practice towards a more nuanced and performative approach. Planning is less about knowledge and more about redirecting action among interconnected (yet independent) stakeholders. Planning becomes facilitative leadership among expertise, power, and difference. The planning process transforms a rational, goal-driven venture to one that involves democratizing a process, which becomes more representative of the possibilities and pitfalls of particular issues.

Technically rational planners can achieve some measure of accomplishment. However, they may fail to recognize that much of the "data" a planner needs cannot be culled from standard socio-economic databases; it resides with residents and other stakeholders. Often, it

cannot be counted. It is only in communication that such information is revealed – and it often comes laden with power relationships, discourse challenges, and misunderstandings about communities, people, and socio-economic systems. This is particularly true with a global commons issue, such as climate change mitigation. Local governments and citizens must understand the real long-term dangers of inaction while centralized expertise and power must not dismiss the local costs of greenhouse gas reductions. In this way, planning must be based on communication as a path to action, and a theory of planning cannot be comprehensive without both communication and action. The pair distinguishes the planning field from studies of political science or sociology.

Planning practitioners are co-producers. Planning does not generate new information, but it can be the kind of institution, as described by Miller (2004), that seeks to incorporate the range of knowledge in active policymaking. Planners communicate, translate, and mediate the components described as essential to bridging the civic and the science (Cash et al., 2003). Planning is more than symbolic or educational. Planning has become the boundary organization between the technical and the civil; planning is the institution that facilitates action. The plan becomes the boundary object from which stakeholders, no matter their perspective, can see their vision reflected. This theory of planning situates the discipline as a co-producer of knowledge and policy.

Competition versus cooperation: governance frameworks for co-production

Planning must be sensitive to power if it is to result in action (Forester, 2012). The ideal of co-production, especially in the context of planning, recognizes the importance of power in relationships; a skillful planning process is vested with the ability to rebalance power differences

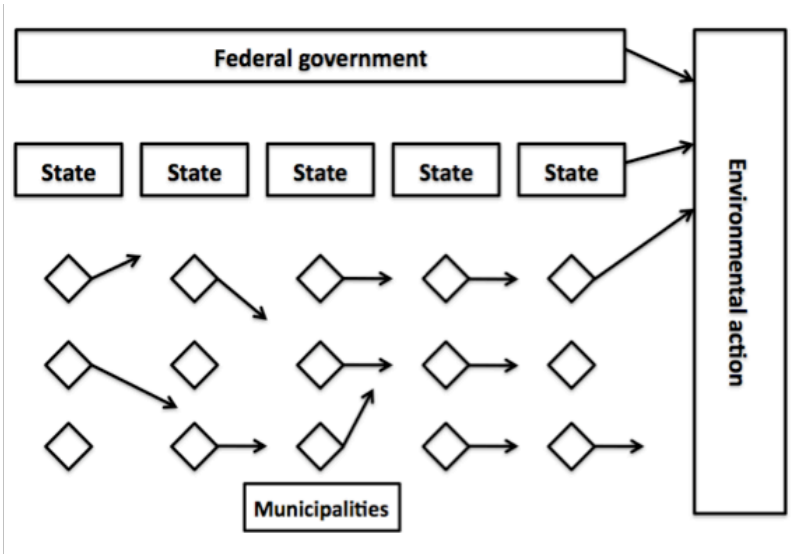
(Innes, 1996). However, I contend that while shared power and collaboration is crucial to climate change policymaking, an overarching authority is needed to enforce and provide coordination, particularly as the number of players starts to grow. For larger scale and longer term environmental issues, such as climate change, the need for coordination across communities in a fragmented governance framework is critical – not only from a knowledge exchange perspective, but also in terms of how the problem is framed, who has power to act, and what happens to externalities (Homsy & Warner, 2013). This concern motivates my attention to co-production within a multilevel governance framework. In this section, I want to illustrate three governance approaches to environmental protection prominent in the discourse around climate change: independent local action, top-down governance, and multilevel governance. This discussion builds to the theory I seek to test in my research – that a multilevel governance framework is necessary to understand the co-production and planning of knowledge and local policymaking for climate change mitigation.

Independent local action

The importance of local government as an independent actor is strong in the United States. The public choice approach theorizes that municipalities might act on their own and innovate local solutions tailored to fit local circumstance (V. Ostrom, Tiebout, & Warren, 1961). Such an independent approach requires strong internal motivation to drive environmental change, which could come in the form of various co-benefits such as budget savings, economic growth, and protection of quality of life (Fischel, 2001; Jochem & Madlener, 2003; Kousky & Schneider, 2003). Local actors better understand local needs and thus may provide for public goods better than a higher authority (McGinnis, 1999). Elinor Ostrom (2009, 2010) hypothesized that this manner of

public goods provision at the metropolitan region offers a model for the governance of the global commons. Such a competitive approach to resource allocation envisions municipalities using strategies best suited to the local environment, citizenry, and other particulars of local circumstance. As illustrated in Figure 2, all levels of government can act and push towards action on climate change. The advantages of this system lie in the diversity and overlapping nature of action as there is little coordination. In the United States, this is the dominant climate change framework as there is no state or federal mandate on climate change action by local governments.

Figure 2 – Independent local action by municipalities



Individual municipal innovations can contribute to sustainability, but realizing the complete utility of these efforts requires developing integrated knowledge systems, such as exists in the agricultural, defense, and health sectors (Cash et al., 2003). Bottom-up action on climate change has been slow to grow among municipalities (Svara, 2011). Independent initiatives cause an economically ineffective patchwork of regulation, duplicative enforcement efforts, cross-boundary mismatches between pollution sources and effects, shuffling of high-carbon activities to weaker regulatory areas, and confusion over responsibility between levels of government(Lutsey &

Sperling, 2008). Systems can become clogged with too many independent localities making too many different policies, which result in a confusing network relationships, lack of transparency, and ill-defined missions (Curry, 2009).

Policy decisions and implementation result in external impacts – some positive, others negative. In a polycentric system of independent actors, local governments can internalize benefits and push negative impacts onto the larger system (Warner, 2011). Local stakeholders grow frustrated with the lack of coordination and express the desire for a holistic approach to greenhouse gas mitigation (Greenwood, 2012). Some overarching institutional framework is needed to mediate and help negotiate differences and development mutually beneficial arrangements (McGinnis & Ostrom, 1992).

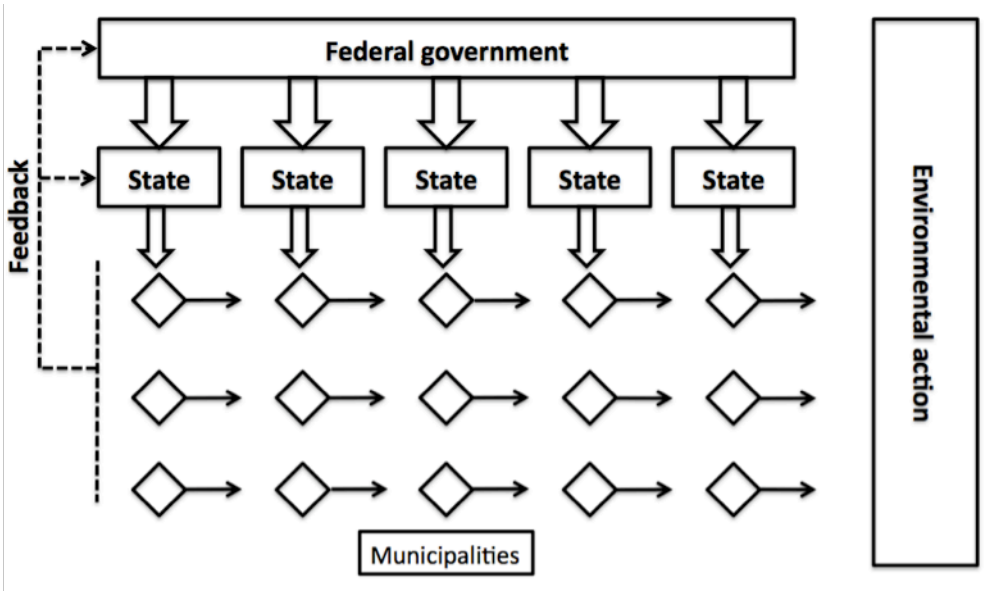
Municipal leaders face obstacles, including divergent views about climate change among stakeholders as well as contradictory perceptions of the role of cities (Bai, 2007). When municipal governments do decide to act, they face legal and administrative challenges: few cities have bureaucratic homes for climate change policy, most municipalities lack the capacity to develop and implement appropriate policies, and action often requires significant upfront costs (Betsill, 2001). Legal frameworks at various governmental levels limit the options available to municipalities (Schroeder & Bulkeley, 2009; Sharp, Daley, & Lynch, 2011). Independent action on climate change undercuts the potential for standardization, which can result in a better regulatory framework and economies of scale around data collection (Sovacool & Brown, 2009).

Top-down governance

As a non-excludable public good, the opportunities for free-riding on climate mitigation are high. In addition, the costs of action are incurred over the short-term, while the benefits can be decades in the future and may be geographically dispersed. Local government action on a

wide variety of external matters, including climate change, challenges the basic economic notion that individuals (in this case individual local governments) would rarely act to protect commons. For this reason, environmental protection has traditionally involved regulations promulgated from the top-down and left little room for local discretion (Fiorino, 2006). As illustrated in Figure 3, local governments often receive environmental marching orders from the federal government through the states. In some cases, there is room for feedback with the federal government adjusting rules based upon data from localities (dashed line). This command and control system is responsible for making the United States a leader in environmental protection by cleaning up the worst environmental problems (Fiorino, 2006). Some maintain this is the necessary model of action on issues of the global commons, such as climate change mitigation (Stavins, 2010).

Figure 3 – Top/down governance



Although still prominent today, by the end of World War II, the field of public administration had realized that in many cases, top-down regulation frustrates efforts to tackle complex problems (Kettl, 2002). This traditional, expert-driven system focuses on technical

problem solving (Fiorino, 2006) and treats the world like a machine to be monitored and repaired in parts (Innes & Booher, 2001), which are easy to administer, but not reflective of reality (Agranoff & McGuire, 2003). Command and control regulations provide little flexibility for fitting solutions to specific local circumstances (Mazmanian & Kraft, 1999). Much information is lost as experts focus narrowly and exclude other voices (Brand & Karvonen, 2007).

Multilevel governance

Multilevel governance is primarily found in Europe. The framework emerged as a way to analyze and organize the European Union relationship with its member states (Bulkeley & Betsill, 2003). It engages multiple tiers of government in a communicative process and authority becomes diffuse, not only across various public actors, but also among private entities (Kern & Bulkeley, 2009). Governance takes place locally and globally, and represents a reconfiguration of authority from top-down to a networked scheme (Bulkeley, 2010).

An important feature of the multilevel governance framework around the issue of climate change is the location that transnational municipal networks hold within it. These networks are voluntary, non-hierarchical, and create a kind of municipality-to-municipality form of self-governance (Kern & Bulkeley, 2009). The networks have limited ability to govern, as they do not have the authority to sanction, but these volunteer networks offer expertise, funding opportunities, and knowledge dissemination in such a way as to form "soft regulations" (Bulkeley, 2010, p. 237) that can induce local action. In the United States, research suggests that network membership by municipalities correlates to only small or moderate increases in greenhouse gas reduction activity (Krause, 2012). Many members are laggards and, as a result, these networks remain effective largely for pioneers (Kern & Bulkeley, 2009).

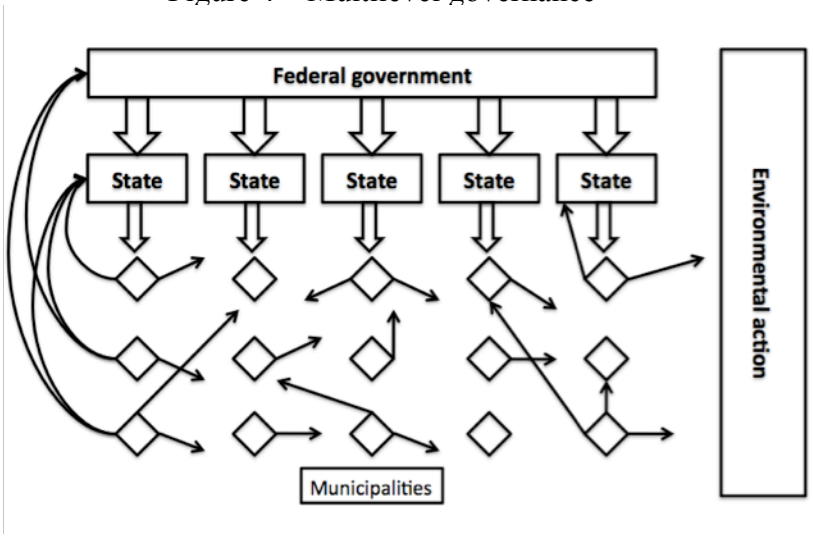
Multilevel governance's synthesis of multiple levels of government and non-governmental organizations has a lot in common with collaborative public management, or network governance (Goldsmith & Eggers, 2004). Agranoff and McGuire (2003) offer three theories for the emergence of such systems. The *social change thesis* argues that technological change allowed people to link across organizational and geographic boundaries. The *problem change thesis* makes the case that a more complicated world requires collaborative structures to pursue solutions. Finally, the *urban regime theory* argues that effective governance requires specialized knowledge and talent often found outside of the public sector. This typology resonates with the emergence of multilevel governance around climate change. More research is needed to situate it empirically, but local greenhouse gas mitigation policies appear to represent the confluence of all three: the emergence of a more complex problem which needs extra-governmental resources and links all of these actors by technology.

"Cooperative federalism" describes a multilevel governance situation in the United States in which state and local governments participate in the implementation of federal standards (Fischman, 2005). For example, in the case of permitting cell phone towers, municipalities are allowed to make local land use decisions regarding the site, but within a broader federal framework (Salkin & Ostrow, 2008). However, this example represents the federal government imposing a national policy on local governments. Then local governments use local policy, developed independently, to achieve the federal goals. Given the relative simplicity of cell phone tower siting, this approach is likely sufficient.

A more interactive and co-productive approach, however, would have multiple levels of government, along with other stakeholders, come to the table with their diverse knowledge and policy perspectives. Figure 4 graphically illustrates such a framework across many municipalities

while the Rouge River Watershed case example, in chapter two, describes a specific case in which multiple stakeholders shaped the policy solution to a complicated environmental problem. Centralized knowledge comes together with local knowledge to develop innovative solutions. Strategies can be shared with other communities as well as passed up the governance chain to be disseminated as best practices. Governing the climate change commons includes increased dialog among stakeholders, government, and scientists; an overlapping and layered network of institutions; and a process for learning and change (Dietz, Ostrom, & Stern, 2003).

Figure 4 – Multilevel governance



Any such collaborative processes may require large investments in coordination and are subject to many challenges including power struggles, turf battles, and expectations of resource contributions (Agranoff & McGuire, 2003; Kettl, 2002; Kraft & Johnson, 1999). Relationships in a collaborative governance framework are not as stable as within a single government agency. Leaders and actors often change (Wilbanks & Kates, 2010) and crucial informal channels are less pervasive in a system with many partners than in a single institution (Goldsmith & Eggers, 2004). Without a central authority, success relies on creating relationships among leaders (Stoker, 2006; Thurmaier & Wood, 2002).

The current project

My contribution to the literature lies in situating theoretically and empirically the role of municipalities in climate change action, particularly in terms of their motivations to act. I bring together theories of policy emergence and focus on the need for a co-productive discourse within a multilevel governance structure where a higher level of government has the power to sanction, coordinate, and incentivize action on greenhouse gas emissions reduction. Research over the last ten years, often through case studies, has described and investigated the initiatives of large, pioneering cities, which have the capacity and the internal motivation to act alone. But these studies, while important, leave out the smaller places that may not have the local drive or resources to act on issues of the global commons. In this dissertation, I seek to broaden our understanding to a more diverse group of municipalities than currently exists in the literature.

The first paper in this dissertation seeks to hypothesize an effective framework for climate change action by local governments. Co-authored with Cornell University Professor Mildred Warner, this analysis focuses on the potential for increased greenhouse gas mitigation policies by rural governments through the co-production of scientific knowledge and policy within a multilevel governance framework. We argue that local knowledge is crucial to effective policymaking, but we caution that local, independent policymaking by municipalities leads to externality problems that require multilevel governance to ensure coordination and compliance. This paper was published in *Sociologia Ruralis*, volume 53, number 3, July 2013.

The second paper empirically investigates the framework outlined in the first paper – that multilevel governance leads to more local climate action than if municipalities act on their own. Using a national sustainability survey of 1,841 municipalities, I test two hypotheses: (1) that municipalities will be more likely to adopt climate change policies in a multilevel governance

framework rather than one in which municipalities must find internal motivations; and (2) that smaller places will benefit more from a multilevel governance environment than bigger cities. I found support for both hypotheses. All municipalities have increased odds of climate change action when engaged in a multilevel governance environment, but the effect is stronger among smaller places. Increased odds of action in larger places is tied to participation in regional multistate networks. Using existing regional multistate coalitions as a model, I present options for a coordination and capacity building governance framework.

This paper is important in the literature because it is one of the first to examine a range of municipalities across sizes and metro status (city, suburb, rural) as well as the first to account for a variety of governance frameworks. It is more generalizable to the American situation because most people do not live in the urban cores often described as climate change leaders. According to the 2010 Census, less than one-third (29.7%) of Americans live in the 313 municipalities with more than 100,000 people. Nearly half of U.S. citizens (46.5%) live in municipalities with a population of less than 25,000 or in rural unincorporated areas. Only 35 cities have more than 500,000 residents and only 278 have between 100,000 and 500,000 residents.

The final paper in this dissertation uses the results of the statistical model devised for the second paper to launch a qualitative inquiry into the question about internal motivations versus external drivers of local climate change action. Given that only certain municipalities adopt greenhouse gas mitigation policies, and most academic scrutiny focuses on the big cities, I sought to use my research to extend our understanding of policymaking in this area to smaller municipalities. In this paper I use interview data from communities that are "unlikely pioneers," which are so deemed because they were predicted by the statistical model in chapter three to have low likelihood of acting – but then they did act. In these communities, the study finds that

policy entrepreneurs, often pushed by internal drivers such as cost savings or personal ethics, were responsible for the climate change action. In a few cases, top-down regulation on municipal utilities provides an external push towards action. I find little co-production of knowledge or policy with other levels of government, although regional networks of peers are important sources of technical information. Finally, the lack of financial capacity, which might be part of a co-productive multilevel governance framework, blocks additional progress on these issues.

Methodological Approach and Limitations

Across the three papers in this dissertation, I use a mixed-methods approach. Such a combined set of strategies allows me to uncover information in different ways, provides redundant data from multiple sources, and ensures that biases from one approach are not replicated in another (Axinn & Pearce, 2006). I use three different strategies. None, individually, gives a complete picture of what is happening. Taken together the picture of action becomes more complete, although much remains to be explored. At the request of my dissertation committee, I include this broad methodological treatment in the Introduction. Each paper also contains the methodological details needed for the reader's comprehension.

In the first paper of this dissertation, my co-author and I use case examples to establish a theoretical framework arguing for the importance of co-production within a multilevel governance environment. We draw examples from academic publications and the general media. We sifted through numerous cases before settling on the three presented in chapter two. Using such broad sources, allowed us to find the stories that best illustrated our theoretical framework and we analyzed our case examples through the co-production/multilevel governance lens described here. We recognize that this methodology is limited because the information in the

cases was described by others with different perspectives. Also, sources from the general media have not been subject to academic peer review. We interpreted them in light of our argument, but that interpretation is a generalization, which may obscure nuances in each example.

In second paper, which comprises chapter three, I devise a multilevel, logistic regression model to examine the socio-economic and governance factors that correlate to local government planning for climate change. The strength of this survey data approach is that conclusions drawn from a large, representative sample are more reliable than inferences from smaller samples or case study research (Axinn & Pearce, 2006). It allows the analysis of internal governance factors in comparison to external multilevel ones and their correlation to local climate change planning.

The sample used for analysis is the most comprehensive national survey of local governments dealing with issues of sustainability. However, this large-n quantitative approach has limitations. First, the selection of variables is governed by previous research, which, in this area, is far from comprehensive. Second, I do not know how well the surveyors pre-tested their instrument. I have realized through subsequent surveys that respondent interpretations of questions can vary. Third, there are only so many predictor variables I can include – or even think to include. For example, I did not conceive of the role of municipal utilities as an independent variable when I built my regression model; its potential importance was not revealed (at least to me) until the interviews of the third paper. (But I learn and grow and have added that factor to newer survey research projects of which I am a part.). Finally, the universe from which the sample was selected does not include unincorporated towns and townships. This leaves out some suburban and rural places in 20 states.[2]

[2] The International City/County Management Association, which conducted the survey, has traditionally excluded town and township type governments. My work on this current project has demonstrated that some of these towns actually have governments with significant functions. My colleagues and I are working with ICMA to revise their sampling methodology.

The third paper (chapter four) builds from the results of the second and seeks to investigate the different motivations of local government officials for action. I use the statistical model from the previous paper to identify deviant communities – those that acted although the expectations of their doing so were very low according to the statistical model. By interviewing public officials from a dozen communities, I am able to strengthen analytical generalizations (Yin, 1998) – and, indeed, I did find corroboratory evidence across the communities. Also, I used key informant interviews with people who have firsthand and more than average knowledge of the local government under study. The interviews were semi-structured, which allows respondents to bring up issues that the researcher had not preconceived (Axinn & Pearce, 2006) and allows researchers to glimpse the key informant's perspective (Patton, 1990). In this case, the lack of rigidity paid off as numerous topics were raised, for example, about the role of citizens or municipal utilities that would not have been discovered in a survey. My focus on deviant cases allows richer information and deeper causation for a problem than examining average cases (Flyvbjerg, 2006).

The weakness of this approach, in general, includes potential bias due to my questions, poor recall on the part of the key informants, interviewees giving me what he or she thinks I want to hear, and response bias (Yin, 1998). More specific to my paper, it should be noted I have not conducted in-depth case studies, but rather examined planning documents and interviewed 15 people in 12 communities. This has allowed my analysis to have some more depth and perspective than possible in the statistical analysis of the second paper, but it is still limited. First, the limited number of cases, although better than a single community, is less generalizable to the broader population of municipalities and municipal leaders than an analysis with a larger sample. Second, one or two interviews per community provides a limited perspective;

recollections fail or are focused on personal efforts rather than understanding broader dynamics. I try to compensate for this by interviewing the person(s) most likely to have that broad knowledge in this issue area, e.g. the city manager, mayor, or sustainability director.

One finding from this third paper (about the reduced role for citizens) runs counter to current sustainability and planning theory and has stimulated ideas for future research. From this third paper, I have identified two places that might be interesting municipalities for in-depth case studies. In these I can further examine the role of the citizen, as well as the notion of local leadership and co-production within a multilevel environment. Also, as originally outlined in my research proposal, I would like to identify and research communities that were more likely to act on climate change, but did not – deviants in a different direction.

Conclusion

In May 2013, the monthly average level of carbon dioxide in the atmosphere topped 400 parts per million for the first time since measurements have been taken – and perhaps for the first time in three million years (Kunzig, 2013). As time passes with little action, the costs of reducing greenhouse gases enough to limit warming to two degrees Celsius will increase dramatically (Rogelj, McCollum, Reisinger, Meinshausen, & Riahi, 2013). What role will cities play?

Taken together the papers in this dissertation demonstrate that expectations of significant municipal action on climate change will not happen without external forces working in a collaborative web. Pioneers do find internal motivations for action, but they are not isolated, independent actors. The research demonstrates that local governments and municipal officials can be innovative and craft the best policies for their local circumstance. However, local governments do not have the fiscal capacity, technical expertise, or power to bring about

significant change on their own. Higher levels of government are needed to provide knowledge and financial support as well as coordinate the action in such a way so as to eliminate free riding. The title of chapter three asks, “Will Cities Save Us?” The answer is that they can make an important contribution to greenhouse gas mitigation, but, for the most part, they do not and cannot act on their own.

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CHAPTER TWO

CLIMATE CHANGE AND THE CO-PRODUCTION OF KNOWLEDGE AND POLICY IN RURAL U.S. COMMUNITIES[3]

Abstract

Climate change mitigation requires action at multiple levels of government. We focus on the potential for climate change policy creation among small rural municipalities in the US. We argue that co-production of scientific knowledge and policy is a communicative approach that encompasses local knowledge flowing up from rural governments as well as expertise and power (to coordinate and ensure compliance) flowing down from higher authorities. Using environmental examples related to land use policy, natural gas hydro-fracturing, and watershed protection, we demonstrate the importance of knowledge flows, power, and coordination in policy creation. Recognizing the crucial role of co-production in rural policymaking, we then apply those lessons to local government action on climate change. In this matter, co-production of knowledge and policy requires respect for local knowledge and a broader framing of issues to include both environmental and economic perspectives. While we see potential for local action, we caution that polycentric approaches lead to externality problems that require multilevel governance to ensure coordination and compliance.

Introduction

Climate change is one of the most contentious areas of public policy in the United States. Even though international talks on climate change have stalled, the potential exists to move

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forward with local governments, which are well positioned to address some greenhouse gas emissions (Betsill & Bulkeley, 2006; Kousky & Schneider, 2003; Ostrom, 2009). Municipalities in the United States have the power to mitigate emissions through land-use rules, transportation programs, building codes, and other policies. However, the number of local governments engaged in concrete action remains relatively low, particularly among smaller places (Svara, 2011). Many American municipalities are small and rural, and lack the technical knowledge and fiscal capacity to act. Many also lack the political will and refuse to accept the conclusions of climate scientists (Carter & Culp, 2010).

A special challenge with climate change policy is that much remains unknown. Although scientific understanding is rapidly evolving, agreement about the seriousness of the climate crisis is being undercut by a disinformation campaign (Jacques, Dunlap & Freeman, 2008). Sociology of knowledge recognizes the crucial role of situational context and the interconnections between normative assumptions, policy judgments and empirical data. Sociology of science scholars stress the importance of an approach that studies science creation as well as its acceptance and its impact on real world policy (Alrøe & Noe, 2010).

A second challenge with climate change is the need to both respect local diversity and to develop structures for the coordination of local action and exchange of knowledge. Land use planners emphasize local perspectives in the formation of environmental, economic, and social equity policies of regional import and within various power structures (Forester, 2012). We believe, along with Martins and Richards (1995), that the participation of local stakeholders is critical as their local knowledge sharpens policies and leads to greater acceptance of conclusions. But how much does situational context matter when long-term issues are scaled up to the global level as with climate change (Hanekamp, 2009)? Just as knowledge and policy imposed from the

top-down may lead to inappropriate action, purely local decision making on regional and global issues, such as climate change, may be ineffective as it faces challenges, such as lack of coordination, externalities, and spillover effects. Linking the knowledge of local stakeholders, including the general public, to higher level technical expertise allows for joint knowledge creation and effective policy action. This co-production approach creates tensions, but also opens the possibility for polycentric action on global issues – action that is owned and respected at the local level (Ostrom, 2009; Healey, 2008).

In this article we explore the co-production of knowledge and policy as it relates to climate change and the rural community response. Using examples of environmental policies that relate to climate change, we demonstrate that co-production, which involves two directions of knowledge flows and learning (top-down and bottom-up), is critical. We also emphasize the importance of framing the issue in a wide enough context to promote local stakeholder support among the diversity of rural communities. Given the importance of externalities in environmental policy, we explore the need for a multilevel governance framework to coordinate co-production and ensure compliance.

In section 2 we demonstrate the importance and potential for a local role in climate change policy. In section 3 we explore three features that make co-production of knowledge and policy so important in climate change: the complex nature of the problem, the need for bi-directional learning (top-down and bottom up), and the need for coordination across a range of actors. Despite the complexity of climate change, local input is required to shape a robust policy response. But externalities and spillovers necessitate some coordination and sanctioning power. In most cases, that might be a centralized authority. However, local governments may have the power to coordinate action with each other through various organizations. This is particularly

important in rural areas where centralized sanctioning power may be less effective. In the fourth section, we present several examples that illustrate alternative architectures for environmental management. Through these we examine the challenges and opportunities facing various environmental governance structures among rural communities and demonstrate the value of multilevel governance, which balances polycentric local action with the power to coordinate in a multilevel government framework. We conclude with implications co-production of knowledge and policy may have for rural areas around the issue of climate change mitigation policy.

Climate change policy in US municipalities

The history of international governmental climate change policy pays little attention to local action, often requiring only token stakeholder consultation when implementing mitigation strategies (Fogel, 2004). On their own many municipalities have moved to address climate change issues. In the United States, states and municipalities have been in the forefront of developing policies to reduce greenhouse gas emissions (Hecht, 2009). American municipalities have the power to manage their own governmental processes, and they can affect the operations of citizens and the private sector in areas such as land use, transportation, and building efficiency through education, incentives, or regulation (Betsill & Bulkeley, 2006). Studies across numerous countries indicate that 30 to 50 percent of greenhouse gas emissions can be controlled through local government policies (Lindseth, 2004).

The impact of big cities versus rural areas on greenhouse gas production is still being researched. Large urban areas tend to be more carbon efficient than sprawling suburbs or rural communities (Glaeser & Kahn, 2010). Many blame cities for 75 percent or more of carbon emissions, though others find that emissions are significantly less, perhaps only 57 percent, with

agriculture and forestry accounting for 31 percent (Satterthwaite, 2008). Suburban residents emit twice the greenhouse gas emissions as urban dwellers (Hoornweg, Sugar, & Trejos Gómez, 2011) and rural commuting comprises a large and growing portion of total miles driven in the United States (Renkow & Hoover, 2000).

Despite such a large portion of emissions emanating from outside of urban cores, the spotlight of local action in the United States shines on big cities. While important, this focus is incomplete. Just one-fourth of the United States population lives in municipalities with more than 100,000 people, and more than half, according to the 2010 Census, reside in jurisdictions of fewer than 25,000 people. Although most live in metropolitan areas within the economic and environmental sphere of a city, each municipality, no matter how small, often develops its own environmental protection, land use, and economic development policies. In urban and metropolitan areas, population density and agglomeration of business and talent promote knowledge sharing and innovation among municipalities and this permits emergence of regional collaboratives that help member communities exploit economies of scale and funding support for climate change mitigation and adaption (Svara, Read, & Moulder 2011).

However, rural and smaller communities lag behind in many ways. Planners seeking to act on climate change in smaller municipalities face lack of political will, disbelief in the value of local action, few peer communities for learning, lack of resources, and a poor scientific understanding of the problem (Carter & Culp, 2010). These challenges lead to lower rates of sustainability policy adoption among smaller and rural places (Homsy & Warner, 2012). For example, a national survey of 2,176 US municipalities and counties in 2010 ranging in population size from 2,500 to more than 8,000,000 found that the rate of undertaking greenhouse gas inventories in communities with fewer than 50,000 residents is one-third that of communities

with a population larger than 100,000 – and only one-sixth in communities with fewer than 10,000 residents (Svara, 2011). Just 55 percent of communities smaller than 25,000 in population have conducted energy audits of their buildings, while 93 percent of municipalities with more than 100,000 people have undertaken such basic energy conservation and climate change measures (Homsy & Warner, 2012). Interestingly, rural areas tend to slightly outperform suburban areas in terms of general sustainability policy adoption, which is likely due to the ability of suburban areas to free ride on the actions of central cities (Homsy & Warner, 2013).

Municipalities do not act alone; legal frameworks at various governmental levels play an important role in shaping the options available to municipalities for open space conservation (Schmidt & Paulsen, 2009) and the mitigation of climate change (Schroeder & Bulkeley, 2009). Small communities in Sweden that make the most progress in greenhouse gas reduction receive significant assistance from the national government (Langlais, 2009).

We argue that local action is crucial in climate change mitigation where the diversity of context and capacity constraints undercut top-down, one-size-fits-all regulation. Rural areas, in particular, seek to reconcile the diverse demands of resource extraction, commodity production, property rights, and environmental protection without the necessary knowledge, structural, fiscal, or political resources (Wolf, 2011). By framing the issue from the local perspective, climate change becomes grounded in local realities, such as floods, droughts, or pest infestations. This may lead to more successful policy interventions as rural residents craft policies that respond to their perceptions of and priorities for action (Ostrom, 2009; Rayner, 2010). However, although a localized approach may help achieve goals of CO2 reduction and climate change adaptation, it will also result in uneven policies. Such a polycentric approach requires a multilevel governance framework to provide the authority for local action, the scale to promote coordination, and the

power to ensure compliance. This is why we give attention to the architecture of a multilevel governance framework in the co-production of knowledge and policy.

Co-production of knowledge and policy

The theoretical basis for the co-production of knowledge in addressing climate change occurs in three arenas. First, as a complex, multidisciplinary and global phenomena, climate change science requires a complex, multi-faceted view. Second, policy and knowledge networks must be open to multiple frames of reference and directions of learning; a simple top-down approach does not work. Finally, attention must be given to power differences and the need to coordinate action across communities. If not, individual actions will lack impact.

Complexity and the Need for Co-Production

The ordering of science through knowledge and technology, and the ordering of society through power and culture create complex interactions (Jasanoff, 2004a). A combined order does not come easily as similar events are interpreted through different frames across communities, within nations, and around the globe. Co-production does not give primacy to either the knowledge of science or the knowledge of society, but recognizes the importance of both (Jasanoff, 2004b).

In the policymaking sphere there exist additional divisions beyond the science-society dichotomy. Scientific knowledge generation is typically top-down and urban centric, and, therefore, associated policies tend to emanate from the center and to recommend solutions that assume ‘one size fits all’, yet climate policies in an urban core may make little sense (physically, culturally, or economically) in most rural communities. Traditional top-down systems promulgate prescriptive regulations, which leave little discretion. They also tend to focus on

individual industrial processes and categories of pollution rather than holistic or ecosystem issues. Compliance is viewed as legal enforcement rather than environmental cleanup (Fiorino, 2010) with success narrowly defined as uncovering evidence of violations rather than innovative approaches to problem solution (Gore, 1997).

Climate change represents an example of what Rittel and Webber (1973) call a ‘wicked' problem, which is hard to define, woven intricately into other issues, and defies efforts to contain within boundaries. Climate change intervention strategies must be comprehensive so that a particular action does not just reduce greenhouse gases in one location or time period or for one product, but affects the entire supply chain or life cycle of the activity (McDonough & Braungart, 2002; Pauli, 2010). The dual scientific/society nature of wicked problems and the fluidity of the processes breed uncertainty and require a multi-faceted approach.

Traditionally, the complexity in rural areas has been ignored; the primary focus of rural policy in the United States is on agricultural production (Bryden & Warner, 2012). The lack of a multi-functional view in US agricultural policy leads to a productivist focus that emphasizes short-term economic competitiveness over more complicated concerns with equity or long term environmental sustainability (Shortall & Warner, 2010). Rural development policy in the European Union has a multi-functional focus uniting agriculture, rural development, and environmental protection (Bryden, 2005; Marsden, 1999; Shortall, 2004). As a result, in the E.U., rural people in particular have come to see themselves as stewards of the environment. This sentiment in less pronounced in the US, in part, because national policy does not articulate stewardship as a priority.

Local framing/ local knowledge – policies that survive

When people see the natural resource under discussion as important to their own well-being, it increases the likelihood of local action (Ostrom, 2010). However, that link is strained when trying to reduce greenhouse gas emissions, which requires short-term costs to the local actor, while the benefits of lowering the gas content in the atmosphere are diffuse; they are distant in time and often distant in place. An additional complication is that the impacts of climate change vary considerably from place to place. Increased droughts and floods will negatively impact some rural populations while benefiting others (Jensen, 2009). For example, in some rural communities logging companies have profited from harvesting trees killed by increased pine-borer beetle infestations, while other rural communities have lost economic livelihood as the same infestations raise threats of fire and cause declines in recreation.

The federal government in the United States has experimented with forms of multilevel governance, dubbed "cooperative federalism" by legal scholars, in an effort to harness local knowledge and account for place-specific situations. Most common in environmental law, cooperative federalism describes a situation in which state and local governments participate in the implementation of federal standards (Fischman, 2005). For example, in the case of permitting cell phone towers, municipalities are allowed to make local land use decisions regarding the site, but within a broader federal framework that facilitates decision-making processes and promotes tower construction (Salkin & Ostrow, 2008). However, with primary control at the local level, municipalities simply act as an agent of federal policy – they can shape decisions within their own borders, but little information flows up to higher levels or horizontally to other municipalities. A more interactive approach has the federal government setting minimum standards that local governments can exceed; this results in more dialogue among actors and

innovation (Sovacool, 2008). For example, in California, both the state and federal authorities made decisions to protect endangered species in the Sacramento River Delta (Fischman, 2005).

Framing in such cases is critical. Local culture, development history, geographic conditions, and historical events impact local policy proposals (Brennan et al., 2009). Environmental policies regarding climate change must be comprehensive and coupled with economic and social equity to ensure sustainability (Svara et al., 2011). This is particularly true among rural local governments in the United States. Research has shown that links to economic development make rural communities more willing to enact environmental protections (Warner et al., 1999). Co-benefits play an important role because they connect local benefits to the local costs of action, and are often the reason some municipalities decide to tackle climate change in the absence of other drivers (Hamilton & Akbar, 2010). Cost savings are a major co-benefit of municipal greenhouse gas reduction programs (Kousky & Schneider, 2003). Another motivator is local public health (Bloomberg & Aggarwala, 2008). Such reframing of climate change can transform an abstract concept to a local, tangible, and actionable one (Metz & Below, 2009). However, such an approach might limit success because it suggests that climate change mitigation and economic growth will always be compatible (Toly, 2008). Also, localizing climate change in this way might push problems from one community to another, if comprehensive environmental laws and monitoring are not enforced across the rural to urban landscape (Bai, 2007).

Rural communities can offer specialized knowledge that makes the co-production of climate change policies more effective. Rural areas in the US are diverse; the 'one-size-fits-all' policies handed down from Washington, just do not translate well (Brown et al., 2003). Although higher levels of authority have the power, the top-down imposition of regulations can alienate

people, who must act on policy. Top-down approaches leave little room for local innovations and issue framing that links global concerns with local priorities. Local culture and social networks, particularly among local leaders, are critical in helping rural communities prepare for and respond to crisis (Flora et al., 2003). Rural communities that engage in the production of local knowledge, learn from difference, and allow symbolic diversity and debate are ultimately more willing to invest local resources toward solving problems (Flora & Flora, 1993). Centralized, expert-driven systems, which focus on technical problem solving and treat the world like a machine to be monitored and repaired in parts undermine the potential for democratic engagement in policy decision making (Fiorino, 2006; Innes & Booher, 2001). A rural community's connection to the natural environment and the environmental values of local officials are important motivators for local action on climate change (Homsy, 2013).

Ostrom (2009) sees potential in such a polycentric localized approach. The core idea of polycentricity is that the users closest to the resource provide the greatest safeguards; they have the knowledge, desire, and relationships. In addition, the distributed nature of local action provides redundancy, encourages innovation, and increases the overall robustness of the system. Some argue that polycentric systems are harder for free riders to exploit due to the mix of institutions and actors involved (Dietz et al., 2003). But lack of coordination and sanctioning authority may increase externalities in such distributed approaches to political, economic and social order (McGinnis, 1999).

Power and Coordination – The Need for Multilevel Governance

In a co-production system, power is needed to enforce and provide coordination, particularly as the number of players starts to grow. Ostrom (1990) gave voice to the idea that users of common pool resources can self organize and protect local resources – to avoid a

tragedy of the commons. Her work shows the value of local knowledge, local control, and local organization in managing environmental problems. However, she describes its success as limited to small groups (Ostrom, 2010). For larger scale and longer term environmental issues, such as climate change, the need for coordination across communities in a fragmented governance framework is critical – not only from a knowledge exchange perspective, but also in terms of how the problem is framed, who has power to act, and what happens to externalities. Purely local provision of environmental services does not recognize the critical importance of power and the need for some level of central coordination. Centralized guidance and incentives have been found to be important in local implementation of climate adaptation policies (Brouwer, Rayner, & Huitema, 2013).

Kousky and Schneider (2003) found that fiscal co-benefits drive local efforts to reduce greenhouse gases. However, rural local governments often do not have the power to make decisions that would result in local co-benefits in some areas, such as transportation, the way that large cities do. Lukes (2005) defines three types of power: power over (typical of hierarchical forms), power to (authority to act) and power with (ability to work together in concert). Too often environmental policy has been built from a power over perspective. Climate change policy needs to build shared power that enables actors at all levels to act in concert. Our concern is that such collaboration still needs the power to coordinate and sanction – a power typically reserved to a higher level of government. This concern motivates our attention to multilevel governance in climate change knowledge and policy action.

With a global environmental issue, such as climate change, there is also the potential for standardization, which can result in a more efficient regulatory scheme and provide the uniformity needed to conduct business across a large area (Sovacool & Brown, 2009). At the

national or global level, there are economies of scale involving data collection and response. Higher levels of governance can reduce the potential of externality and spillover effects between local jurisdictions. Decision making on a community-by-community basis also risks becoming clogged with too many participants, resulting in confusing network relationships, lack of transparency, and ill-defined or parochial missions (Curry, 2009).

Reliance on local action also creates coordination problems. Every policy action results in ancillary impacts (Jochem & Madlener, 2003). A characteristic of polycentric governance systems is the incentive for one group to internalize benefits and shed negative externalities onto the larger system (Warner, 2011a). An institutional framework is needed to mediate these differences by having various parties come together and work out mutually beneficial arrangements (McGinnis & Ostrom, 1992). In rural cases, networked governance has co-evolved as both a response to and a driver of environmental change and resource management challenges (Wolf, 2011).

Rural communities have experience with horizontal collaboration, especially in government service delivery (Warner, 2006). They often face thin private markets for service delivery and need to create a public market of cooperation to address their problems (Warner, 2011b). Experience with collaborative approaches is primarily horizontal and functional; the challenge is to build vertical collaboration in a multilevel governance framework that respects the unique knowledge of rural communities. This is the promise of co-production of knowledge and policy, which recognizes the potential for neo-endogenous rural development based on a multi-faceted, multilevel governance framework (Shucksmith, 2010).

Any promise, however, will not be realized without addressing differences in capacity between rural and urban communities. Rural areas with weak economic development, small tax

bases, and limited capacity can be trapped in a vicious cycle of underinvestment (Warner & Pratt, 2005). Homsy and Warner (2013) found that smaller municipalities rely more heavily than larger ones on the citizenry to shape and oversee sustainability policies. The study also found professional municipal management is more important to sustainability policy adoption in smaller places than in larger ones, but cities have more technical staff for policy adoption and implementation. Other studies find similar results, for example, Carter and Culp (2010) found rural municipalities in the western United States lack the technical knowledge and fiscal capacity to adopt local climate change policies.

Knowledge generation in environmental policy creation

In this section, we use a series of case examples to make clear the drawbacks when local governments produce environmental policy on their own or when policy production is purely centralized without local knowledge. We rely on media and project reports for these examples. While not full case studies, these examples demonstrate the importance of co-production of knowledge and policy and the need for a multilevel governance architecture in which local governments act as more than agents of higher level policy, but partners in its production.

No state (or the federal government) imposes top-down climate change rules on local governments or engages in efforts to co-produce greenhouse gas mitigation policies. Therefore, we build our case, initially, around examples drawn from other environmental issues of the regional commons. These illustrate the types of challenges facing local government action on climate change, the most important global commons issue today. They demonstrate that rural municipalities struggle to act on issues much closer to home than climate change, and they show the potential a multilevel governance framework, in which policy is co-produced, can have

positive results on commons issues. We focus our analysis on local governments, which exercise control over numerous sources of greenhouse gas emissions and adaptation policies through their jurisdiction over land use regulations and related transportation policy (Betsill, 2001).

Not coincidentally, these case examples also have links to climate change. For rural areas, settlement patterns, natural gas extraction, and water quality are arenas where climate change has critical impacts. First, from the perspective of climate change mitigation, we look critically at the connection between local land use planning and inefficient settlement patterns. In this first example, we discuss the benefits and limits of the traditional polycentric approaches to land use control at the local level, and the challenge for coordination either through state policy or voluntary networks such as ICLEI – Local Governments for Sustainability. Our second example looks at natural gas, which is a potentially cleaner fossil fuel. Its extraction is typically outside the control of local government. In this instance, we see how failure of communication up and down levels of government has hindered knowledge flows and produced tension between local and statewide environmental protection and economic development goals. Our final example presents a successful co-production process with a multilevel governance framework that resulted in the protection of a large watershed that crosses many rural and urban communities. It offers a potential model of climate change policy co-production among federal, state, and local levels of government. A comparison across these examples shows the critical importance of the multilevel governance architecture in polycentric co-production systems, especially for rural areas.

America's fractured land planning system – the limits of polycentrism

Land use regulations – the ability to control physical development – are critical tools in local climate change mitigation and represent one of the few strong powers that local

governments have in the United States. The 50 American states establish broad frameworks within which municipalities can act, but land use planning is a power typically reserved to local discretion (Frug & Barron, 2008). Local governments can make decisions on the location, size, density, and aesthetics of buildings and this impacts the settlement patterns and transportation requirements of the community. In many cases, this local control builds on local knowledge and results in physical development that respects local needs and culture. Land use decisions are usually made independently of circumstances in neighboring municipalities, including regional environmental concerns, and there is no recourse when the actions of one community negatively impact another. This bottom-up process is markedly different from Europe where, for example, in Germany and England land use regulation is shared among all levels of government with national agencies setting policies for local governments to implement (Schmidt & Buehler, 2007; Williams, 1999).

The lack of coordinated land use planning across municipalities in a region can result in sprawl and associated greenhouse gas emissions. Worldwide transportation accounts for 13 percent of greenhouse gas emissions (Dulal et al., 2011), but in the United States it is twice that level (27 percent) (US EPA, 2011). Rural and suburban land use regulations typically encourage low-density development, and the strict separation of land uses makes automobiles a necessity (Brandes et al., 2010; Andrews, 2008; Ewing et al., 2007), especially in rural areas (Renkow & Hoover, 2000: Champion & Brown, 2012).

Land use policy is both uncoordinated in the United States and municipalities often compete for real estate development and property taxes engendering hostility between them (Pendall, 2003). This can be particularly true in rural and peri-urban communities that have limited economic development opportunities. The communities most likely to chase economic

development with business incentives are those with lower tax bases, higher unemployment, and who face the highest levels of inter-jurisdictional competition (Warner & Zheng, 2013). In such an environment, municipalities have an incentive to promote development that ignores negative environmental spillovers on neighboring communities and the region (Howell-Moroney, 2008).

A few states, such as Oregon and California, encourage local governments to coordinate land use to achieve broader environmental goals (Daniels, 2001; Barbour & Deakin, 2012). Oregon coordinates local land use among rural and urban governments by requiring communities to work together to draw urban growth boundaries that protect forest and farmland, concentrate development, and curb the spillover impacts of sprawl (Daniels, 2001). Local planning rules must be consistent with state policies (Abbott et al., 1994). California recently passed legislation, which requires local governments to coordinate land use and transportation planning with the specific goal of decreasing greenhouse gas emissions (Barbour & Deakin, 2012).

Such arrangements can be considered passive examples of co-production. They allow the opportunity to use local knowledge in specific contexts to shape rules within regional goals set by the state. However, the states usually do not engage actively with municipalities in drafting local land use rules. Instead, they provide centralized knowledge in the form of generalized guidance and best practices about ways to achieve central goals through local land use. Local governments then find ways to adapt these for themselves. Unfortunately, most states do not offer much of a coordinating policy framework for local governments.

The lack of guidance from state or federal governments in the United States is problematic given the broad externalities of land use decisions on climate change. The role of incentivizing and coordinating local action has fallen to various non-governmental organizations; the most prominent, and illustrative of the challenge of voluntary action, is ICLEI Local

Governments for Sustainability. This international organization is among the largest engaging with local governments to coordinate land use planning in an effort to reduce greenhouse gas emissions. Formed in 1990, with 200 member municipalities, ICLEI has grown to a network of 1,220 local government members in 70 countries with more than 550 in the United States (ICLEI 2008). This transnational network of local governments facilitates the exchange of ideas, offers technical assistance and information, and sets policy goals (Bulkeley and Betsill 2003). ICLEI carries no formal authority, but it does have an impact on members by virtue of the opportunities and resources it offers including technical expertise. ICLEI resources include best management practices, access to protocols to simplify the complicated task of inventorying emissions, target setting, and other forms of "soft regulation" (Bulkeley 2010, p. 237).

With only several hundred member municipalities across the entire United States, ICLEI's lack of penetration into rural communities is not a surprise. Traditionally, such non-profit actors have played a minor role in the efforts of rural areas to govern their natural environments (Wolf, 2011). Local and technical capacities are the limiting factors as smaller communities often lack the human resources needed to craft and implement sustainability policies. Approaches based on co-production and polycentrism thus fall short in achieving a broad impact unless a multilevel governance framework provides for the power to incentivize and enforce new policy approaches.

Gas drilling and knowledge flows – the importance of local knowledge

Climate change policy, especially reducing greenhouse gas emissions, can be very place specific. Policies centrally supported that, for example, advocate increased public transportation will work better in a dense urban core than in a rural municipality. But this distinction between place-appropriate policies may not be so obvious. Programs to support local upgrades of

buildings or purchase alternative fuel cars or increase density may have little impact in a small town with a tiny vehicle fleet or only one municipal building.

However, when rural communities become engaged in sustainability actions, they can expand the discussion with the injection of local knowledge. One example that illustrates the problems when local governments are ignored is the debate over the new high volume hydro-fracturing techniques for extracting natural gas in New York and Pennsylvania. This case demonstrates the critical importance of co-production of knowledge in yielding a more complete scientific and policy understanding of a complex issue. It also shows the need for a communicative co-production process within a multilevel governing framework where higher authority respects the diversity of interests and local knowledge across the rural landscape.

The Marcellus Shale reserves under New York and Pennsylvania offer the promise of meeting much of the US energy needs for years to come. Geologists estimate the formation may contain up to 489 trillion cubic feet of natural gas (NYSDEC, 2012). Natural gas extracted from shale has a smaller carbon footprint than oil or coal (Cathles et al., 2012). New York State views gas drilling as a positive climate change mitigation strategy as well as an opportunity to boost the economically depressed rural upstate region. In 2008 the state legislature updated its compulsory integration law to allow gas companies to drill under private land in spacing units of 640 acres if 60 percent of the acres in that unit are leased by landowners to the gas drilling company (NYSDEC, 2008). This was designed to prevent private landowners from holding out and blocking drilling on neighboring property.

New York State leaders perceived drilling as important to energy sustainability, economic development, and equity for rural areas, but the issue turned out to be more complicated. Pennsylvania pushed forward with drilling while New York continued to study the

process and conduct environmental reviews. Between 2007 to 2010, 1,454 wells were drilled in 33 counties of rural northern Pennsylvania. Estimates of economic impacts suggest between $2 and $5 billion in new revenue, 29,000 construction jobs, and $240 million in state and local tax revenues (Considine, 2010). However, early enthusiasm for drilling has been moderated by local concerns over water quality (groundwater contamination and surface stream spills), truck traffic and impacts on road quality, and the negative social and economic impacts on housing and long-term employment (Christopherson, 2011).

Little understood at the beginning, at least by the public, were the implications for water quality. Safe groundwater is an important public health issue for rural residents, and an economic issue as the region's agricultural industry is based on dairy farming, and cows require clean drinking water. In the hydro-fracturing process, each well uses an estimated one to six million gallons of water mixed with unknown chemicals (the identities are trade secrets) that frees the natural gas from the shale rock. The wastewater must be treated to avoid contamination of streams and neighboring water wells.

Local recognition of this issue in New York has led the Conference of Environmental Health Directors (a statewide group of county health officials) to recommend the state ensure that the costs of water testing and treatment are covered by drilling fees (Riha & Rahm, 2010). This organization of county health departments – who hold primary responsibility for responding to water quality complaints – is an example of an institution that could serve the function of a boundary organization between state agencies and local officials. Boundary organizations facilitate knowledge transfers, mutual understanding, and provide space through which diverse perspectives can co-produce knowledge and policy (Guston, 2001). If the state would engage this network of county health departments, a more appropriate policy might be co-produced.

Wear and tear on rural roads is another example of the local economic impacts not considered initially. Drilling each well requires from 600 to 1,100 truckloads of water – a significant portion of them driving on rural roads, which were not necessarily built to handle this traffic load. Even paved roads, which cost up to $100,000 per mile to rebuild, cannot handle this kind of traffic for very long (Randall, 2010). This new knowledge has led to recommendations for 'road use agreements' and 'haul route management' – but local governments do not have the power to enter into such agreements without state approval.

A 2013 study found 179 communities had passed restrictive legislation regarding shale gas extraction in New York and 60 had passed legislation in support of drilling (Frickey, 2013). The study found those communities passing restrictive legislation were larger, richer, more highly educated, and located adjacent to metropolitan areas. They also had lower trust in the willingness of higher levels of government to protect their local interests. Indeed, the federal government had specifically exempted shale gas extraction from the Safe Drinking Water Act in 2005 (U.S. EPA, 2005).

The top two concerns driving these local actions were water quality and road maintenance. By resorting to land use laws, one of their few strong local powers, these towns have used local legislation to inject their concerns into the debate. So far, the local drilling restrictions have withstood court challenges by gas drilling companies. This approach, if it continues, will establish a patchwork of local rules that make resource extraction inefficient (some drilling companies have already announced that they will pull out of the New York market) and may increase negative externalities, as well as hostilities, between municipalities as some enact tougher standards than others.

These town bans grew out of local public debate. Such strong debate – both pro and con – is forcing more study and bringing more of the conflicting scientific views to light. This is an example of how local engagement can broaden the framing of an issue. The challenge is to ensure that such discourse leads to co-production of knowledge and joint policy action. Absent strong state leadership in a co-production approach, the contentious debate threatens to drag on in an uncoordinated manner that leads local governments to act on their own. In reaction to this movement, the Governor of New York State has proposed a more limited "pilot" approach where drilling will be allowed only in the richest shale deposits and in towns that support extraction. This may create opportunity for more collaborative learning and policy generation, or it may just be a stop gap political measure that undermines coordination. New York State is still struggling to figure out how to co-produce policy and share power in a multilevel governance framework.

Watershed Protection via a Co-production Approach

Our main contention is that local government climate action is best developed through co-production across multiple levels of government. Our third example illustrates such a cooperative approach focused on watershed protection, which was piloted in Michigan and is now being pursued by the US Environmental Protection Agency (EPA) in other states. As with climate change, the issues around protecting a large regional watershed are complex and involve many commons issues. Just as the atmosphere is a non-excludable public good, so, for the most part, is a large watershed. Water pollution (both point and non-point) is a very technical engineering issue, which is wrapped up in a diverse variety of values represented by local officials, business leaders, land developers, recreational fishermen, environmental groups and so on. Officials at the EPA decided to "require the support of the regulated community" (U.S. EPA, 2003, p. 2) when it sought to broaden watershed protection beyond the point-source, top-down

regulation of individual polluters. Federal regulators chose this co-production approach because they believed it would yield more efficient and innovative solutions needed to make additional improvements in water quality.

In the US, the federal EPA has the authority to regulate discharges into waterways. Traditionally, this has been handled on a pollutant-by-pollutant basis with the agency issuing point-source discharge permits. Agency leaders decided to encourage a local and regional look at pollution across a watershed. EPA recognized watershed-wide protection of water quality as a collective action problem, and that the solution should involve a variety of stakeholders. Flexible strategies that allow a more comprehensive and sustainable solution might better address pollution. Administered by state and regional offices, the watershed-wide program involves various stakeholders, such as local governments, residents, and polluters, in an active process to collect information and design effluent reduction strategies that fit particular situations, but still meet national standards (U.S. EPA, 2003).

One of the reasons the EPA chose the co-production approach to watershed management was its success in the Rouge River Watershed, which began as a pilot project in 1997. The watershed, in southeastern Michigan, consists of four waterways – a 44-mile long main river and three major branches. The watershed encompasses nearly 450 square miles with more than 1.3 million people in 48 communities. Half of the land is urbanized, including the city of Detroit and surrounding suburbs, and half is rural. Water quality concerns focused at first on the 168 combined sewer overflows that dumped polluted water into the various waterways during heavy rains. Over the course of the project, the issues broadened and various programs were introduced to correct the overflows, eliminate illegal discharges, and strengthen the system of green infrastructure (Garrison & Hobbs, 2011).

Communities came together voluntarily in the Rouge River Project as an alternative to imposition by federal courts of a stormwater authority that would direct the river's rehabilitation in a top-down manner (U.S. EPA, 2007). Municipalities (who were also the main polluters as owners of the combined sewer overflows), environmental activists, and other citizens brought their local knowledge to multiple working groups and crafted policy solutions suitable to local circumstances. Seven of these advisory groups, one for each major sub-watershed, also included community residents, county agencies, watershed councils, and other stakeholders. A watershed-wide steering committee oversaw the entire project and coordinated the advisory groups. The process garnered local support by building accountability within local power structures; it also included broad public education. The co-production process recognized the differences between urban and rural places with allowances made for smaller and rural communities within the watershed, which did not contribute much to the problem, to have less stringent requirements.

This successful co-production took place within a multilevel governance framework. The federal government initiated and coordinated the action – and had the power to impose a solution if the collaboration failed. The federal government, along with the state, provided the technical expertise and other resources necessary to facilitate the co-production. Municipalities owned the polluting outfall pipes and most had the local authority to reshape development regulations to reduce runoff pollution.

Environmentally, the program has been a success (Cave, 2003). Pollution from combined sewer overflows has been cut 90 to 100 percent during most rainstorms. Toxic chemicals are no longer a major concern in the river with acceptable levels of health for biological communities throughout the watershed. For the first time in decades, people can consume the fish caught in one lake of the watershed. Salmon now migrate up from the Detroit River to the headwaters of

the Rouge River and the number of amphibians has increased. Eventually this co-production watershed protection program was adopted across the State of Michigan and the EPA is now pursuing a similar strategy for watershed protection in other states.

What do these cases teach us about co-production of knowledge and policy? The first two cases illustrate the limits of local action and the need for a multilevel governance framework. While local control over land use policy in the US permits local experimentation and voice, it undermines regional coordination and is subject to severe capacity constraints and problems with externality spillovers, especially in rural areas. This suggests that while co-production of knowledge and policy is necessary to ensure upward information flows and local support for policy adoption in rural areas, local control is not sufficient to address commons issues that cross jurisdictional boundaries, like climate change. The second example concerning natural gas in New York also demonstrates the limits of top-down regulation and the need for local knowledge to shape policy for coordination, knowledge exchange, and sanctioning power that can enhance local action. The promise of a multilevel governance framework is presented in the Rouge River case. Federal, state, and local actors coordinate in a network approach that respects local knowledge and diversity, but sets a common framework of standards upon which all parties can act. Our goal is not to present the precise mechanisms by which such a multilevel system can be achieved, but rather to demonstrate that true co-production makes local governments partners in policy, rather than simply agents of implementation.

Conclusion

US rural communities face difficult challenges in addressing climate change as they did in addressing the environmental issues used as examples here. The fragmented nature of local

government, local capacity constraints, and the inability to address cross-jurisdictional externalities threatens the efficacy of a polycentric approach to climate change policy. Relatively few municipalities act on their own on climate change (Boswell et al., 2011; Svara, 2011). When they do act, we see the potential for the same kinds of problems stemming from our first example about America's fractured land use system. Independent municipal policies cause leakage, as industries move from place to place seeking low regulation environments, and create an economically ineffective patchwork of rules, duplication of efforts, confusion of responsilibities, and free-riding (Lutsey & Sperling, 2008).

And yet the absence of national policy on climate change leaves local solutions as an important alternative. In this paper we present an approach that preserves the benefits of polycentrism in the co-production of knowledge and policy that is so critical to rural acceptance, innovation, and responsiveness to the unique nature of rural problems, while ensuring that externalities and capacity constraints are addressed. That solution is the articulation of a multilevel governance framework that creates bidirectional knowledge flows and shares power for sanctioning across actors in the environmental governance network. Unlike in Europe where some national governments have taken up the cause of climate change, the United States lacks an overarching governance framework. Rural communities and small towns represent the majority of the American landscape and thus make broadening the drive for local climate action beyond large urban areas represents a critical challenge.

We envision co-production to generate knowledge and policy for local climate change action that involves federal, state, and municipal levels of government. The lessons from our three case examples lead us to think about ways in which a co-production system could be formed around this issue. Using our third example, of successful co-production to clean up the

Rouge River Watershed, we can see that the federal government plays the role of convener and holds the ultimate authority to compel action if dialog is not successful on ways to reduce greenhouse gas emissions. Perhaps the federal government and the states (or groups of states as described in the next chapter of this dissertation) co-produce legal goals and broad guidelines around the issue of climate change. This process would establish a framework for action. The states then translate this output into local action through a co-productive dialog with their municipalities. This would be particularly important to rural communities, which might not otherwise get a seat at the climate change table. To varying degrees, depending on the nature of the local action, the federal government and the states would provide fiscal capacity and offer technical assistance.

This framework is crucial for climate change mitigation because the systems involved are complex, knowledge evolves rapidly, and buy-in from multiple stakeholders is required. As illustrated by our third example of the Michigan watershed, such an approach ties local knowledge from diverse rural areas to centralized expert knowledge and coordinated goals. We have explored issues of power, situational context, and framing, as well as coordination and the challenge of local enforcement across rural areas. Our examples show that framing the issue in a broader context and allowing co-production of knowledge and policy may facilitate more rural community attention to environmental issues. This offers some small promise for future positive movement on climate change. However, our study also demonstrates the critical importance of a multilevel governance framework.

Despite its potential, co-production is not a guaranteed solution. It can involve a much larger commitment of resources to produce policy than simply having one handed down from a centralized authority (Lemos & Morehouse, 2005). There are often conflicts between local

stakeholders and centralized scientific experts due to diverse perspectives, values, and motivations (Edelenbos et al., 2011). As a collaborative process, one party who simply works to delay a decision can undermine it (Kraft & Johnson, 1999), although the centralized authority within a multilevel governane framework can ameliorate that concern.

Designing the organizational structure for policy design and implementation requires attention both to the positive power of network governance and to it limitations. Polycentric environmental governance networks need coordination, and members need both capacity and power to sanction. The challenge will be to design such co-production systems so that power is shared and the voice and concerns of rural communities are included.

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CHAPTER THREE

LOCAL CLIMATE CHANGE PLANNING: WILL CITIES SAVE US?

Abstract

Climate change planning and implementation successes in cities such as New York, Chicago, and Boulder foster the notion that cities will lead on climate policy from the bottom up. The absence of federal leadership in the U.S. and a strong tradition of localism has created a system in which many national issues, including climate change, are left to municipalities. However, the reality is that few local governments undertake climate change planning. This study seeks to understand why some municipalities choose to act on this global commons issue. I use a survey of 1,841 municipalities ranging in population size from 1,997 to 741,206 to examine the role of state climate action plans and state-to-state regional climate change initiatives in creating a multilevel governance environment conducive to local action. A series of logistic regression models find that the likelihood of a municipality planning for climate change mitigation increases in a supportive multilevel governance environment.

Despite the hype surrounding the success of big cities and other municipal pioneers, policymakers cannot presume that climate mitigation planning will occur independently community-by-community from the bottom-up. Although current state climate action plans and state-to-state regional initiatives do not mandate municipal action, these governance structures create a political and resource environment conducive to local government climate change planning. I propose a new form of multistate regionalism that might establish a more effective local government network for climate change planning than existing voluntary municipal networks or traditional state-by-state efforts.

Introduction

Climate change represents a global commons problem and efforts to arrive at an international solution among nations fall far short (Barrett, 2008; Stavins, 2010). In the absence of such action, a number of municipalities have undertaken greenhouse gas reduction efforts and have raised the possibility that this lowest level of government will lead the fight against climate change from the bottom up (Gore & Robinson, 2009; Kousky & Schneider, 2003). However, while the number of municipality-based climate action plans has grown to several hundred in the United States (Boswell, Greve, Seale, & Mroz-Barrett, 2011), in relationship to the thousands of U.S. municipalities, the proportion engaged in climate planning remains miniscule (Svara, 2011).

In the United States, federal climate change policy focuses on industrial sectors, especially the reduction of emissions from coal-fired power plants and the increase in motor vehicle fuel efficiency (Crane & Landis, 2010). The federal government has paid little attention to the climate policies of local governments and expressed only limited interest in promoting other sustainability goals. In 2009, the federal government announced the Partnership for Sustainable Communities, a multi-agency effort to craft a national vision for local sustainability, which includes greenhouse gas emissions reduction. Although the Partnership funded scores of community and regional projects, particularly to improve coordination between land use and transportation planning, the program suffered funding losses and failed to develop the measures and tools necessary to establish concrete standards (Birch & Lynch, 2012).

Environmental regulation in the United States has traditionally been top-down with solutions that assume 'one size fits all' (Fiorino, 2010). In many cases, such an assumption is too crude. For example, climate policies in a dense city with public transit and walkable streets may make little sense (physically, culturally, or economically) in a suburb or rural community

dependent upon automobiles. Traditional top-down regulations typically leave little room for local adaptation and tend to focus on industrial processes and categories of pollution rather than holistic or ecosystem issues. As environmental problems have increased in complexity, top-down regulation has slowly yielded to more networked approaches.

With climate change, the policy debate pits a polycentric governance approach against a multilevel governance framework. On most issues, notions of polycentricity and localism have become ingrained and are largely publicly supported (Honadle, 2001). Municipalities in the United States control public schools, public safety, and land development. Local governments also impact greenhouse gas emissions since municipalities often manage land-use, transportation programs, building codes, and other policies (Betsill & Bulkeley, 2006). This view hypothesizes that local governments, on their own and in competition with each other, will adopt local greenhouse gas mitigation solutions that best fit their cultural, economic, and social circumstance (E. Ostrom, 2010). On the other hand, a multilevel approach to climate change envisions political authority shared among different tiers of government and across a range of public and private actors (Bulkeley, 2010). It is not the competition that provides effective environmental action, but the coproduction that occurs from a respect for local knowledge and policy innovation combined with a centralized source of capacity and authority to coordinate and/or coerce action (Homsy & Warner, 2013).

In this paper, I examine whether or not such a multilevel governance environment would enhance municipal action on climate change mitigation or whether local governments do better operating in a local, independent manner. The federated nature of the 50 states provides a good laboratory for testing since each state has a different regulatory and policy environment. Although no states mandate municipal climate change mitigation, some states have climate

change plans and supportive policy frameworks, while others do not. Some states also belong to state-to-state regional initiatives that craft plans to mitigate greenhouse gases. In this study I find that a multilevel governance environment enhances the likelihood of local climate change action, particularly among small municipalities. In the concluding section, I offer a policy approach to create multistate regional frameworks to induce local government climate action.

Cities and local climate change planning

Municipalities play an important role in climate change mitigation for five reasons. First, cities produce a significant portion, if not the majority, of greenhouse gases (Satterthwaite, 2008). Second, the tens of thousands of American municipalities can impact their own operations by building energy efficient government buildings or retrofitting old ones; they can install efficient street and traffic lights; some experiment with alternative energy generation (Svara, Read, & Moulder, 2011). Third, local governments use incentives, regulations, or other policies to shape private sector activities. For example, Washington, D.C., Carbondale, Colorado, and Huntington, New York impose green building requirements on development projects over a certain size (Salkin, 2009). Through land use regulations, cities can require denser, more efficient development or provide transportation alternatives to the private automobile (Jepson, 2004). Fourth, municipalities can access an increasing number of national organizations and transnational networks (e.g. ICLEI-Local Governments for Sustainability, US Conference of Mayors) that offer technical knowledge and shape the political space for local action (Bulkeley, 2010). Finally, cities are first responders to potential climate-caused disasters. Local responders are the first on and the last to leave scenes of catastrophes (FEMA, 2008).

Our understanding of local climate change action comes largely from research that examines large, urban centers or municipalities that are pioneers (Bulkeley & Betsill, 2003; Kern & Bulkeley, 2009; Kousky & Schneider, 2003; Portney, 2013; Tang, Brody, Quinn, Chang, & Wei, 2010). However, in the United States, just over half of the population lives in municipalities with fewer than 25,000 people. Only a quarter of Americans live in the fewer than 300 cities with more than 100,000 residents. The reality is that most municipalities do little planning for climate change. A 2010 national survey finds that only 12 percent of American cities had created an emissions inventory or set reduction targets (Svara, 2011). A database of municipal climate action plans finds only 177 cities have complete plans and 220 have in-progress or otherwise incomplete plans (Boswell et al., 2011) among the tens of thousands of local governments in the United States. Smaller communities tend to lag larger ones in the adoption of general sustainability policies (Homsy & Warner, 2012) and need substantial technical, financial and planning assistance to integrate sustainability into their plans (Lubell, Feiock, & Handy, 2009).

New York City, Chicago, Boston, Austin and other urban centers have developed significant plans and have made important implementation strides toward reducing their greenhouse gas emissions. Their actions offer the promise that municipalities can tackle the global commons challenge of greenhouse gas emissions from the bottom up (E. Ostrom, 2010). However, most communities have not begun to act on their own and many researchers of climate action frame effective policymaking through a multilevel governance approach (Bulkeley, 2010). Below I discuss the theoretical foundations for each position and some empirical results.

Multilevel governance

The multilevel framework emerged originally as a way to analyze and organize the new European Union relationship to its member states (Bulkeley & Betsill, 2003). This approach

engages multiple tiers of government in a communicative process that requires the co-production of knowledge up and down levels of authority as well as a respect for local knowledge in the creation of place-specific policies. At the same time it recognizes the role of a central authority, which has technical expertise and the ability to coordinate and induce compliance through incentives or regulations (Homsy & Warner, 2013). Incentives and clear guidance from higher levels of authority provide important inducements for action (Brouwer, Rayner, & Huitema, 2013), though the federal government rarely participates with local governments on climate issues (Selin & VanDeveer, 2009). An increasing number of states and U.S. regions continue to enact policies on climate change (H. Rabe, 2009), but most focus on industry sectors, not local governments (Selin & VanDeveer, 2009). State-level climate plans set goals and offer policy options (Wheeler, 2008), but have only reduced greenhouse gas emissions by a small amount – largely through green building and vehicle efficiency programs (Drummond, 2010). No states mandate local government action. The closest is a 2008 California law that requires urban regions to meet greenhouse gas reduction goals by coordinating land use and transportation policy (Barbour & Deakin, 2012).

An important feature of the multilevel governance framework is the location that transnational municipal networks hold within it. These networks represent efforts by localities to bridge political borders and function as conduits for information and best practices (Gustavsson, Elander & Lundmark, 2009). The volunteer networks have limited ability to govern and no authority to sanction, but they offer expertise, funding opportunities, and knowledge dissemination in such a way as to form "soft regulations" (Bulkeley, 2010, p. 237) that induce local action. However, these networks remain largely for pioneers with little impact on regional or national policies in Europe; though the most active members benefit from horizontal city-to-

city innovation transfers (Kern & Bulkeley, 2009). In the United States, research suggests that network membership by municipalities correlates to only small or moderate increases in greenhouse gas reduction activity (Krause, 2012).

Some state governments in the United States have formed their own horizontal networks on environmental issues with varying degrees of success. Water quality in the Great Lakes was dramatically improved through the creation of the Great Lakes Commission and the Council of the Great Lakes Governors, which provided a regular forum for information flows among state leaders (B. Rabe, 1999). In 2001, the Conference of New England Governors and Eastern Canadian Premiers created a climate action plan with aggressive targets while the Western Governors Association established clean energy goals aimed at new technology development (H. Rabe, 2009). The cap and trade program run by Regional Greenhouse Gas Initiative in the northeastern United States realized a net positive economic impact of $1.6 billion (Hibbard, Tierney, Okie, & Darling, 2011). Such networks could lead to greater emissions reductions than single state efforts due to greater geography and population, potential for uniformity of regulation, ability to capitalize on shared resources and economies, and development of a shared regional vision (Engel, 2005). However, these networks remain state-to-state affairs with plans rarely engaging local governments.

A multilevel framework is not completely foreign to American governance; the federal government has experimented with cooperative federalism, in which local and state governments participate in the implementation of federal standards (Fischman, 2005). For example, the federal government, by threatening to impose top-down regulations, built a coalition of local governments and private actors to cut water pollution, reduce the danger of toxic chemicals, and improve the habitat in Michigan's Rouge River watershed (U.S. EPA, 2007). In some cases, the

federal government establishes minimum standards that lower levels of government may exceed, resulting in more dialogue and innovation (Sovacool, 2008).

Local control

If multilevel governance envisions a cooperative network approach with information flowing up and down levels of government as well as horizontally across municipalities, local control represents a public choice model in which the competition for residents and businesses drives the provision of public goods. Metropolitan-level polycentrism arose in the 1960s, when V. Ostrom, Tiebout, and Warren (1961) demonstrated that some public services, such as policing and education, are best provided at the local level. They maintained that intermunicipal competition and local government's close connection to constituents can result in cost-effective outcomes and local innovations. Local actors better understand local needs and thus better provide public goods than a higher authority (McGinnis, 1999).

Elinor Ostrom (2010) hypothesized that this provision of public goods at the metropolitan region level offers a model for the governance of the global commons. She contended that a variety of public and private actors (including municipalities, utilities, households, firms, nations, etc.) will be driven by competition and local advantages to create independent solutions to greenhouse gas reductions using strategies best suited to the local environment, citizenry, and other particulars of circumstance. Diffuse local action unburdens the dysfunctional international climate negotiation agenda by pushing priorities onto lower levels (Rayner, 2010). Benefits of local independent action include: more experimentation and innovation, local tailoring of action to fit circumstances, political testing of policies, and local experience in enforcement.

Recent studies indicate that some localities act independently on climate change policy (Krause, 2011a, 2011b; Pitt, 2010). Communities are more likely to act on their own when

climate change mitigation is linked to a policy already on the local government agenda (Betsill, 2001). These co-benefits emerge in various forms: reduction in energy costs (Kousky & Schneider, 2003; Svara et al., 2011), increased public health (Bloomberg & Aggarwala, 2008), or economic development and job production (Jochem & Madlener, 2003). Such reframing of a global problem transforms an abstract concept to a locally tangible one (Metz & Below, 2009).

However, municipally-driven initiatives also cause an economically ineffective patchwork of regulation, duplicative enforcement efforts, cross-boundary mismatches between pollution sources and effects, shuffling of high-carbon activities to weaker regulatory areas, and confusion over responsibility between levels of government (Lutsey & Sperling, 2008). Local stakeholders grow frustrated with the lack of coordination and express the desire for a holistic approach to green house gas mitigation (Greenwood, 2012).

Research Method

This paper seeks to empirically investigate the debate around the ability of local governments to plan for climate change. I use a broad survey of U.S. municipalities to test the hypothesis (H_O) that municipalities will be more likely to adopt climate change policies in a multilevel governance framework. The alternative hypothesis (H_A) states that such a framework will not increase the likelihood of policy adoption. In addition, I examine the role that a municipality's population size plays with the secondary hypothesis (H_2) that smaller places will benefit more from a multilevel environment than bigger cities.

Testing such these hypotheses requires finding situations that approximate multilevel governance of climate change in the United States. No states mandate local government action on climate change, but states do have differing levels of commitment to the challenge which can

be measured as a more or less conducive atmosphere for policy action. In addition, numerous states have joined multi-state initiatives that focus on climate change mitigation.

This project takes advantage of an extensive survey of sustainability planning and implementation by U.S. municipalities. The 2010 Sustainability Survey, conducted by International City/County Management Association,[4] asked county and municipality leaders about their adoption of policies and programs in areas such as climate change, water quality protection and provision, building construction, and land use. Surveys were mailed to a sample of municipalities with populations of more than 2,500 people and to all counties; the overall response rate is 25.4 percent. This analysis focuses on the lowest level of government and, therefore, includes only non-county municipalities. It is further limited to communities with a population of fewer than 1,000,000 people. Within these parameters, managers of 7,257 local governments received surveys and 1,874 responded (25.8% response rate). Complete demographic, fiscal, and governance data was gathered for 1,841 municipalities, which represents the final number of local governments in my analysis.

Dependent variable

The dependent variable, *climate change planning community*, is based on six climate change planning actions that a community might undertake. This variable is dichotomous and a municipality receives a value of one if it reported on the survey that it has officially adopted or created any one or more of the following:

- A baseline of greenhouse gas emissions produced by the local government (i.e. inventory);
- A baseline of greenhouse gas emissions produced by the community (i.e. inventory);
- Greenhouse gas reduction targets for local government operations;

[4] The survey was conducted in collaboration with researchers at Arizona State University's Center for Urban Innovation and ASU's Global Institute of Sustainability. A descriptive summary of the results can be found in Svara (2011).

- Greenhouse gas reduction targets for businesses;
- Greenhouse gas reduction targets for multi-family residences; or
- Greenhouse gas reduction targets for single-family residences.

Establishing a baseline of emissions for either the local government or the community is a major undertaking for a municipality and indicates a commitment to climate change action. Adoption of the various targets can be symbolic, but also indicates an official intention to address greenhouse gas emissions. Table 1 shows the percent of municipalities which engaged climate change planning communities by population size. The adoption of policies is clearly more prevalent among larger municipalities.

Table 1 – Percent of climate change action communities by population size

Population size	Percent adopting	Number adopting	Total number in sample
2,500 to 9,999	8.1	69	848
10,000 to 24,999	15.2	77	508
25,000 to 99,999	34.7	135	389
100,000 to 499,999	49.5	45	91
500,000 to 999,999	60.0	3	5
Total	17.9	329	1,841

Independent variables

The independent variables and the sources of the data are described in Table 2 and are grouped into following subject areas.

Multilevel variables. Two dichotomous variables examine the potential link between a multilevel governance framework and local government climate action. The first measures whether a municipality's state has a climate action plan, which was true for 1,180 municipalities

in the sample. The second indicates whether the state is a member of a regional climate change initiative. In 2010, there were four regional initiatives (Western Climate Initiative, Regional Greenhouse Gas Initiative, Midwest Greenhouse Gas Reduction Accord, and the Transportation and Climate Initiative) that covered 14 states and 535 municipalities in the sample. The main hypothesis would be supported by the positive correlation between these two variables and the increased likelihood of a municipality being a climate change action community.

Population variables. As the descriptive statistics in Table 1 show, population size appears directly related to climate change planning. We use this variable to examine the secondary hypothesis about the role of city size and expect a multilevel environment to increase the odds of action more for smaller places than for larger ones. The model also includes, as demographic controls: population change, and population density, which have been shown to positively correlate with general municipal environmental policies (Krause, 2011a; Schmidt & Paulsen, 2009; Tang, 2009). The same is expected in the current study.

The following variables control for the internal characteristics of communities.

Geographic factors. Central cities are expected to have a greater likelihood of enacting climate change policies than either suburban or rural areas, even when controlling for population size and local fiscal capacity. Service spillovers from core cities could explain why some suburbs invest less in programs, such as affordable or higher density housing or industrial development (Pendall, 2000) so suburbs are hypothesized to make a lower investment in climate change actions. Rural areas may underperform in comparison to central cities as they suffer from reduced knowledge transfer from distant urban cores.

Table 2 – Summary statistics for variables

Variables	Municipalities (n=1,841) Mean (or percent 'yes' for 1/0 variables)	St. Dev.	Minimum	Maximum
Dependent variable				
Climate change action community [a] (1=yes)	17.9	NA	0	1
Independent variables				
Multilevel factors				
State climate plan [b] (1=yes)	64.1	NA	0	1
State participation in regional climate initiative (1=yes) [b]	28.7	NA	0	1
Population variables				
Population [f]	27,882	54,461	1,997	741,206
Pop. change 2000-2010 [f] (percent)	13.8	31.8	-36.6	510.8
Density [f] (people/sq. mile)	2096.4	1849.7	3.1	17112.4
Control variables				
Geographic factors				
Central cities [a] (1=yes)	9.2	NA	0	1
Suburban municipalities [a] (1=yes)	59.3	NA	0	1
Rural communities [a] (1=yes)	31.5	NA	0	1
Local politics				
City manager government [a] (1=yes)	62.0	NA	0	1
Voting for Al Gore [c] (percent)	45.7	11.7	13.7	79.5
Economic dependence				
Employment change 99-09 [g] (percent)	4.1	19.6	-57.5	178.9
Agricultural employment [d] (percent)	2.7	3.8	0	27.4
Manufact. employment [d] (percent)	12.5	6.1	0.7	67.1
Local capacity				
Local govt. rev. per capita [e] ($)	984	949	0	18,279
Educ. att. (bachelor plus) [d] (percent)	28.6	16.1	2.4	86.8
Per capita income [d] ($)	27,883	12,770	6,399	124,327

[a] derived from ICMA Sustainability Survey, 2010
[b] Center for Climate and Energy Solutions, 2011
[c] Lublin & Voss, 2001
[d] American Community Survey, 2005-2009
[e] Census of Local Governments, 2002
[f] U.S. Census 2010
[g] County Business Patterns, 1999-2009

Local politics variables. Public administration research has found that council-manager forms of government enact more innovative policies (Nelson & Svara, 2012) because managers tend to be entrepreneurial and offer innovations that have been vetted by professional associations (Schneider, Teske, & Mintrom, 1995). Svara (2011) found the link between innovation and council-manager forms of government holds true for general sustainability policies. Presence of a council-manager form of government is expected to increase the odds of climate change planning.

Previous research has demonstrated that political attitudes in a community impact local sustainability policy in general and climate change in particular (Barbour & Deakin, 2012; Krause, 2011a; Slavin, 2011; Zahran, Brody, Vedlitz, Grover, & Miller, 2008). The percentage of votes for Al Gore in the 2000 presidential election serves as a proxy for this. A positive correlation is expected between votes for Gore and the odds that a community will adopt climate change policies. Data is for the county in which the municipality sits and comes from Lublin and Voss (2001).

Dominant economic players. Environmental protection is often seen as in conflict with economic development (Campbell, 1996). However, some studies focusing on climate change show no correlation between the presence of manufacturing and climate policy action (Krause, 2011a; Sharp, Daley, & Lynch, 2011; Zahran et al., 2008) though other studies indicate that local manufacturing decreases the chances that a community would act (Bulkeley & Betsill, 2003; Gustavsson et al., 2009; Krause, 2011b). Three variables control for this in the current study. The first is the 1999 to 2009 change in the number of jobs within the municipality's county, which represents general economic development; a negative correlation to the odds of climate action is predicted. The other two variables are the percentage of people employed in manufacturing and

agriculture/extractive operations. Increased employment in these sectors is expected to decrease odds of a locality taking climate change action.

Local capacity variables. Local capacity examines the ability of a municipality to carry out climate change planning. Local government revenue per capita measures the ability of a community to raise funds through taxes and fees and thus fund policymaking and programming. Educational attainment (percentage of the population with a bachelor's degree or more) is a measure of the potential for community members to provide volunteer expertise and human resources for planning climate change mitigation. Finally, per capita income has been shown to correlate with general sustainability policies and climate change action in particular (Sharp et al., 2011; Zahran et al., 2008). All capacity variables are expected to positively correlate with the odds of a community planning for climate change mitigation.

Analysis of results

The main hypothesis, its alternative, and the secondary research question were tested using a series of six logistic, multilevel, random intercept models. This hierarchical approach accounts for the clustering of municipalities in states. The first three models include just the presence of a state climate action plan. Models four, five, and six also include as an additional factor the state's participation in a regional initiative. The models are then differentiated by population size: municipalities with populations of more than 25,000 people (n=485); smaller communities between 2,500 and 25,000 in size (n=1,356); and the entire sample (n=1,841). The results of the logistic regression models are presented as odds ratios in Table 3.

Table 3 – Results of multilevel logistic regression

	State climate plan			State climate plan & regional initiative		
Model	**1**	**2**	**3**	**4**	**5**	**6**
	All (n=1,841)	Large (n=485)	Small (n=1,356)	All (n=1,841)	Large (n=485)	Small (n=1,356)
Multilevel variables	*Results presented as odds ratios*					
State climate plan	**2.0992	*2.0524	**2.222	*1.759	1.530	*1.993
Regional initiative				1.597	**3.219	1.289
Population variables						
2010 Population (logged)	**1.668	*1.598	*1.547	**1.690	**1.731	*1.547
Pop. change 2000-2010	0.999	1.000	0.997	1.000	1.001	0.997
Density 2010	1.000	1.000	1.000	1.000	1.000	1.000
Control variables						
Geographic factors						
Central cities		Reference			Reference	
Suburban municipalities	*0.543	*0.504	1.520	*0.538	*0.471	1.500
Rural communities	*0.550	0.571	1.471	0.558	0.615	1.474
Local politics						
City manager government	1.128	1.225	1.07	1.154	1.394	1.082
Voting for Al Gore (percent)	**1.034	*1.033	*1.029	**1.031	*1.029	*1.028
Economic dependence						
Employment change 99-09	1.004	1.006	1.003	1.004	1.003	1.003
Agricultural employment	1.013	1.076	0.994	1.017	1.081	0.995
Manufacturing employ.	0.972	0.991	*0.952	0.974	0.996	*0.953
Local capacity						
Local govt. rev. per capita	**1.000	**1.001	**1.000	**1.000	*1.000	**1.000
Educ. att. (bachelor plus)	**1.049	**1.036	**1.053	**1.049	**1.035	**1.053
Per capita income	**1.000	**1.000	**1.000	**1.000	1.000	**1.000

*** indicates significance at the 0.01 level * indicates significance at the 0.05 level*

The results support the main hypothesis that the multilevel factors positively correlate with the odds that a municipality undertakes climate change planning. The first multilevel factor, the presence of a state climate plan, increases the likelihood of local action from 75 to more than 200 percent in five of the six models – even though no state plan directly requires action by municipalities. The exception is model five, which focused on bigger places. In this model, the presence of a state plan proved insignificant, but the other multilevel variable, regional initiative, correlated to increased odds of local climate change planning by over 320 percent.[5]

This result contradicts some previous research, which finds that municipalities act independently on this issue in a polycentric manger and that states play no role in local climate action (Krause, 2011a, 2011b; Pitt, 2010). Two factors might account for this divergence. First, the dataset in the current study is larger and broader. In her two studies, Krause (2011a, 2011b) only examines places with populations greater than 25,000 and 50,000 respectively; those more likely to act. The second factor is the difference in the construction of the dependent variables. In one study, Krause (2011a) uses the U.S. Mayors Climate Protection Agreement as a dependent variable, which requires neither the resource investment of a greenhouse gas inventory nor the political capital needed to officially adopt emissions reductions goals. The second Krause study (2011b) and Pitt (2010) employ as the dependent variable an additive index of policies which could reduce greenhouse gas emissions. However, many of the policies (e.g. tree ordinances, recycling, bike lanes, public transit incentives, regional planning for growth, and encouragement of mixed-use/pedestrian-oriented development) need not have been undertaken with the intention

[5] The model was also run without the presence of the multilevel variables and the results for the internal factors changed little in the six models.

of reducing emissions. Who can say whether a community's efforts to encourage public transit, for example, derives from a desire to fight climate change or to reduce congestion or provide transportation to low-income residents? To a practitioner, these differences may not be important because the multiple facets broaden the pool of policy supporters. However, researchers seeking to study climate change planning need to make such distinctions; otherwise we are simply testing smart growth or general sustainability. The dependent variable in the current study is targeted to a community's actions (creation of an emissions inventory) and intentions (adopted goals and targets) and represent specific climate change policy commitments; it offers a clear measure of policy intention.

The secondary hypothesis, that smaller municipalities would benefit more in a multilevel environment than larger cities, is also supported with regards to state climate plans. The impact of a state climate plan is much stronger among small municipalities (models three and six) than larger ones (models two and five). However, the additional participation in a regional climate change initiative produces no benefit to smaller places and correlates to greatly increased odds of climate change planning in larger places. Smaller places may simply remain tied to states, which provide needed fiscal and technical capacity as well as political cover. This is an important difference between larger and smaller municipalities. Population change and density are not significant in any model.

One of the control variables, percentage of manufacturing employment, also indicates an important difference between larger places, where it is not significant, and smaller places, where it has a negative correlation to the odds of climate change planning. In smaller communities, the power of such dominant players could work against greenhouse gas reduction by local governments as factory management and employees would hold political power. The other two

economic variables, employment change between 1999 and 2009 and level of agricultural employment, are not significant.

Educational attainment was a significant factor in all six models and a one percent increase translates into a 3.5 to 5.3 percent increase in the odds that a community would plan for climate change. Once again, the impact was stronger in smaller communities by about 34 percent as these are places likely to turn to citizens for the technical capacity lacking among their staff. Local government revenue per capita was significant across all six models, but the size of its impact on climate action was almost too small to measure. Per capita income was significant in five of six models, but its actual impact was negligible.

The geographic control variables indicate that suburbs have 46 percent lower odds of climate change planning. This is as expected since suburbs benefit from urban spillover effects in many different issues (Lowery, 2000; Pastor, Lester, & Scoggins, 2009; Pendall, 2000). Rural places also have 45 percent lower likelihood of climate change planning. This could result from the lack of fiscal capacity and technical knowledge as well as the politics described as barriers to climate change action in these places (Carter & Culp, 2010).

Two variables test form of government and political progressiveness. The form of government variable (presence of a council manager) is not significant, which is opposite of what was expected. Perhaps as a pioneering action, climate change planning is so new that the typical advantage of council-manager forms of government do not apply. Political progressiveness, in the form of votes for Gore in the 2000 presidential election, found that each percent vote for Gore consistently increases the odds of climate action by about three percent in all six models.

Policy implications

My analysis indicates that a multilevel governance framework facilitates more climate change planning by local governments than the largely local approach so common among issues today. Some cities, particularly bigger ones, will act on their own remain pioneers of local climate change action, but the vast majority will do nothing independently. Unlike in Europe where some national governments and the European Union took up the cause of climate change (in word if not in deed), the U.S. lacks an overarching governance framework for municipalities. The challenge for practitioners and policymakers is identifying the governance structure that might foster the most effective multilevel framework. Regional efforts often focus on metropolitan areas in which municipalities have successfully coordinated to achieve affordable housing, economic development, open space conservation, and watershed protection goals (Wheeler, 2002). More broadly, states are the traditional mechanism as they possess the existing legal authority to structure municipal actions (Frug & Barron, 2008), though this goes largely unused with regards to climate change.

Another potential approach to fostering local government climate planning builds on an existing supra-state structure: regional climate change initiatives. Regional coalitions of states, such as the Regional Greenhouse Gas Initiative or the Western Governor's Initiative, currently have little interaction with municipalities, but as groups of states, the initiatives have the authority to provide the coordination, capacity, and policies needed to induce local government climate planning. The strength of these multi-state regions over metropolitan regions is their broader geographic scope, which can more effectively eliminate free-rider problems and reduce leakage that pushes polluting industry to places with weaker regulations. Many states may be too small geographically and economically to be effective. These multistate networks overcome the

weakness of transnational municipal networks as all municipalities would be members and the states would have the authority to induce local action. They would also have the resources needed to provide fiscal and technical capacity to municipalities.

Most interestingly, these geographically regional networks would be comprised of municipalities more likely to share economic goals and political constituencies than the current voluntary transnational networks. The regional coalitions could set goals, perhaps in conjunction with the federal government, and states could codify those targets for their municipalities. States could, but need not, impose top-down regulations; they could allow local governments to innovate within the state/regional coalition established multilevel framework. Pioneering policies developed by municipalities would be immediately more relevant to other members of the regional coalition. For example, municipalities in the northeast could share strategies to reduce their natural gas emissions, while those in states that use more coal could develop outcomes for their specific challenges. These groupings also produce stability of membership within the regional initiatives. None of the nine northeastern states within the current Regional Greenhouse Gas Initiative mine coal within their borders. If the coalition tried to add coal-producing Pennsylvania to the mix, it is likely the network would become unstable and policy innovations less common to all members. In some ways the boundaries of multi-state regional initiatives approximate a large European state with a common heritage, similar climate, and comparable economic situation.

Conclusion

Much has been written describing the contents and effectiveness of climate change planning by local governments. Less well investigated is the motivation for local action on this

global commons problem. My analysis of 1,841 municipalities indicates that there exists little internal motivation for climate change action as most communities simply have not acted on their own as expected by proponents of public choice theories of urban policymaking. Planners and other policymakers must realize that the hope for a locally-driven, bottom-up approach to climate change will remain limited to pioneering municipalities. Even in the absence of state mandates, local governments are more likely to plan for climate change when a multilevel governance framework creates a conducive policy environment. Smaller communities benefit more from state climate plans, while larger cities plan better when a multistate regional framework exists.

The shared geographies, economies, and climate of states within existing regional initiatives may offer a new approach to multistate regionalism around the issue of climate change. Local government concerns over free-riders and spillovers can be controlled among groups of states, which have the legal authority to sanction local governments. As coalitions of states, these networks can set enforceable goals as well as foster and disseminate municipal innovations. Given the important role that municipalities should play in climate change mitigation, practitioners at all levels need to think creatively about ways to foster constructive planning and action.

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CHAPTER FOUR

UNLIKELY PIONEERS: SMALL CITY LEADERS IN CLIMATE CHANGE

Abstract

Absent national guidance, some U.S. municipalities have enacted greenhouse gas reduction policies. These actions provide the opportunity to examine why local governments act on global commons issues. Two approaches are tested: public choice theory, which argues that municipalities act based upon internal drivers, and multilevel governance, which frames local policies as arising from both internal and external factors. In this study of twelve smaller municipalities, deemed "unlikely pioneers" because they acted on climate change against the odds, the results show support for both theories. Public entrepreneurs spearhead climate policies independently by reframing global issues with an internal focus, but fiscal capacity limits response. Multilevel governance is found in places with municipally-owned utilities, which face top-down regulation to reduce emissions. However, these municipalitis have more access to capacity that enables action. Leaders in both groups describe the importance of regional or statewide networks for support, but not citizen engagement in motivating action.

Introduction

Local government officials tend to focus on issues that impact their constituents. These include demands for newer and better services, lower taxes, economic growth, quality of life, and protection of property values (Schneider, Teske, & Mintrom, 1995). Decisions made by local leaders are short-term and locally-focused, which is not surprising given the length of the political and budgetary cycles. Given this internal focus, it makes little sense for municipalities

to enact climate change mitigation policies on their own (Kousky and Schneider 2003). Integrating such global issues into municipal policy can be complex (Bai, 2007) as local action requires incurring costs today to tackle a problem with benefits that may not be realized for decades and which may be diffuse around the world leading to a classic tragedy of the commons (Hardin, 1968).

Yet municipalities do have responsibility and opportunities to act. Some research finds cities responsible for 50 to 75 percent of carbon emissions (Satterthwaite, 2008; Stern, 2006). American local governments have control over tens of thousands of municipal buildings, fleets of local government vehicles, streets lights, traffic lights, and other sources of greenhouse gas emissions. Also, local governments can use incentives, regulations, or other policies to shape private sector activities, including imposing green building requirements, increasing residential and commercial density, or providing transportation alternatives to cars. Finally, the close connection that municipalities have with businesses and residents gives them an important educational function as role model (Collier, 1997).

Some local government pioneers have chosen to take on the challenges of climate change mitigation. For example, a 2010 survey of local governments found that 22 percent try to conserve energy in vehicle fleets and outdoor lights; 12 percent have inventoried greenhouse gas emissions or set reduction targets; and five percent offer energy audits to private businesses (Svara, 2011). While several hundred municipalities have created and adopted climate change action plans (Boswell, Greve, Seale, & Mroz-Barrett, 2011), there are tens of thousands of local governments in the United States and the vast majority does nothing (Svara 2011).

Local government policies to reduce greenhouse gas emissions came in two waves of urban governance (Bulkeley, 2010). The first, beginning in the early 1990s, were efforts by

pioneers, such as Toronto, Leicester, Munich, and Frankfurt, which created climate change mitigation policies based on existing energy conservation. These cities were also the first to form networks that evolved into ICLEI-Local Governments for Sustainability, the Climate Alliance, and others. The second wave, dating from the early 21st century, centered on these municipal networks, which had matured. Many were now nationally organized; they included private sector actors and a more diverse range of cities. Environmental protection regulations in the United States traditionally have been handed down to municipalities from higher levels of government (Fiorino, 2006). The lack of similar guidance for climate change mitigation and the initial action among municipalities offer the hope that local governments can tackle this global commons challenge from the bottom up (E. Ostrom, 2010; Rayner 2010).

The current research seeks to understand why local governments act on global commons issues and to add to the literature on theories of municipal policymaking. My research focuses on communities – "unlikely pioneers" – who were not expected to act on climate change issues, but then did. I use interviews with local leaders and a review of planning documents in twelve of these communities to understand whether climate change mitigation policy arises from internal factors in an independent, polycentric manner or derives from a more multilevel governance approach. This project contributes to a broader understanding of local policy emergence around issues of global commons because most research on local climate change drivers and policies examines large, urban centers (Bulkeley & Betsill, 2003; Kern & Bulkeley, 2009; Kousky & Schneider, 2003; Portney, 2013; Tang, Brody, Quinn, Chang, & Wei, 2010). While important, such an agenda is incomplete. The vast majority of municipalities in the United States are small with just over half of Americans living in communities of fewer than 25,000 people and with less than one-third residing in the mere 313 American cities with more than 100,000 residents.

Among these unlikely pioneers, I find that public policy entrepreneurs push climate action by shaping local agendas in ways that can address global concerns. Some of the local leaders in my sample are driven by internal factors, including cost savings, competition for economic development, threat of climate change's impact, and personal ethics. In most cases, these leaders face capacity constraints to ongoing action. Officials in other municipalities are pushed by the external regulations imposed on them indirectly through their municipally-owned utilities. These leaders were able to (or sometimes required to) use some of the utility revenue for energy conservation and greenhouse gas reduction programs. Leaders in both groups of communities relied on professional networks for technical knowledge with established sustainability networks less important. Surprisingly, citizens action did not play an important role in initiating action in these pioneering communities.

Theories of local policy emergence and climate change

In this section, I review two main groups of policymaking theories at the local government level. The internal, polycentric theories are policy entrepreneurship and public choice. Then I review theories of less individualistic drivers of action: top-down governance, institutional collective action, and multilevel governance. Finally, I touch on the literature that describes the importance of local government capacity to policy action.

Individual action by municipalities

Pioneering climate change efforts in municipalities are often driven by individual local officials (Bulkeley 2010). Such policy entrepreneurship is an internal theory of action that involves local officials recognizing and seizing opportunity for change within a community (Page, 2006). These leaders transform social perceptions in order to generate need and then meet

that need through a new policy (Schneider, Teske, & Mintrom, 1995). Top leadership does not have to drive local climate policy, but it must be supportive (Bassett & Shandas, 2010; Young, 2010). For example, Denver's early adoption climate change mitigation can be traced to a staff person in the city's Department of Health who recognized the confluence of city goals with early urban climate efforts; other municipal officials soon found ways to shape programs to support the mayor's vision of the city as an environmental leader (Bulkeley & Betsill, 2003).

Clever policy entrepreneurs push climate change mitigation when it is linked to a policy already on the local government agenda; it becomes a "co-benefit" (Betsill, 2001). At the state level, policy entrepreneurs have had success connecting climate policies to long-term economic opportunities (Rabe, 2004). Communities can invest in energy conservation to save money locally while the broader public good of reducing greenhouse gas emissions is also served (Kousky and Schneider, 2003). Co-benefits also emerge in forms such as increased public health (Bloomberg & Aggarwala, 2008), sustainable economic development and local job production (Jochem & Madlener, 2003), or local impact of climate change (Zahran 2008). Dannevig, Hovelsrud, and Husabø (2013) found local leaders crucial in pushing climate change adaptation in Norwegian cities.

The competition for economic development or residential growth is the focus of public choice theory (Fischel, 2001; Tiebout, 1956). Intermunicipal competition and local government's close connection to constituents can result in cost-effective outcomes and local innovations. Local actors better understand local needs and thus provide for local public goods better than a higher authority (McGinnis, 1999). Such a competitive approach to resource allocation envisions municipalities using strategies best suited to the local environment, citizenry, and other particulars

of local circumstance. Elinor Ostrom (2009, 2010) hypothesized that this manner of public goods provision at the metropolitan region offers a model for the governance of the global commons.

Citizen activism can be an important internal factor driving decision making. Citizen activism has been shown to be positively correlated to local government action on sustainability issues (O'Connell, 2009; Portney, 2013; Portney & Berry, 2010; Ramírez de la Cruz, 2009; Svara et al., 2011; Zahran et al., 2008). Citizen-led movements are the primary reason that suburbs have moved towards protecting the environment and quality of life and away from economic growth (Berry, 1999; Gendron & Domhoff, 2009). Community-based planning and stewardship promotes ecological understanding and improves the local environment (Shandas & Messer, 2008). The local knowledge and perspective of stakeholders focuses policies and increases the support for policies in the community (Martin & Richards, 1995). When the public is engaged in problem solving, more innovative community policies result (Fung, 2008).

Top-down, institutional collective action, and multi-level governance

Local government action on climate change challenges the basic economic notion that individuals (in this case individual local governments) would not act to protect common pool resources. Therefore environmental protection efforts have traditionally involved regulations promulgated from the top-down. Such a centralized rule structure leaves little room for local discretion (Fiorino, 2006) and frustrates efforts to tackle complex problems (Kettl, 2002). Command and control regulations provide little flexibility for adjusting regulations of commons problems to specific local circumstances (Mazmanian, 1999).

One alternative to a command and control approach is institutional collective action which argues that municipalities self-organize in various ways around environmental protection (Feiock, 2004). When spillover benefits of such collaboration outweigh the transaction costs of

forming new institutions, communities have a strong incentive to work together through a series of voluntary associations on issues, including economic development, environmental protection, or other commons goals.

A third alternative has emerged in the form of multilevel governance, which involves multiple tiers of government engaged in a communicative process among public and private actors (Kern & Bulkeley, 2009). The advantage of a multilevel framework stems from the co-production of both knowledge and policy from the top down as well as the bottom up (Homsy & Warner, 2013). The number and diversity of local climate change mitigation policies arising among Swedish municipalities is likely to have national impacts (Gustavsson, Elander, & Lundmark, 2009) although climate change adaptation at the local level in Europe benefits from centralized incentives and technical guidance (Brouwer, Rayner, & Huitema, 2013). Multilevel governance may include voluntary transnational municipal networks that create a kind of municipality-to-municipality form of self-governance (Kern & Bulkeley, 2009), though, in the United States, research suggests that network membership correlates to only small or moderate decreases in greenhouse gas emissions (Krause, 2012).

While such formalized networks of professionals can advance the knowledge and interests of members, they can also slow innovation by creating an orthodoxy of accepted knowledge or best practices (Wolf, 2008). Collaborative processes may require large investments in coordination and are subject to many challenges including power struggles, turf battles, and expectations of resource contributions (Agranoff & McGuire, 2003; Kettl, 2002; Kraft & Johnson, 1999). The key to success lies in creating relationships among leaders (Stoker, 2006) and communication to establish inter-municipal relationships and promote knowledge diffusion.

Local government capacity

Budget is a primary concern for local action. Financial resources enable policy action and these resources include funding and technical skills (Thompson, 1965). Local government capacity is limited and each municipality must respond to its citizenry (Peterson, 1981; Tiebout, 1956). To add services, such as environmental protection, local governments must have the capacity to seize new opportunities (Watson, 1997) and, as the problems become increasingly complex, the need for capacity increases (Honadle, 2001).

Local officials note lack of capacity in terms of insufficient funding, technical expertise, and/or staff time hinders climate efforts (Pitt & Randolph, 2009). Fiscal stress leads to reduced implementation of climate change policy (Homsy, 2013). General sustainability action rises in communities with better fiscal health (Lubell, Feiock, & Handy, 2009), though wealthy communities and bigger cities also face budget constraints that limit climate change action (Bulkeley & Kern, 2006; Holgate, 2007). A majority of big cities (more than 50,000 in population) apply for sustainability grants while less than half have a regular budget line for sustainability (Wang, Hawkins, Lebredo, & Berman, 2012). The fact that most municipalities in the United States are unable or unwilling to mitigate greenhouse gas emissions (Svara, 2011) draws attention to the compelling question of why some places do act.

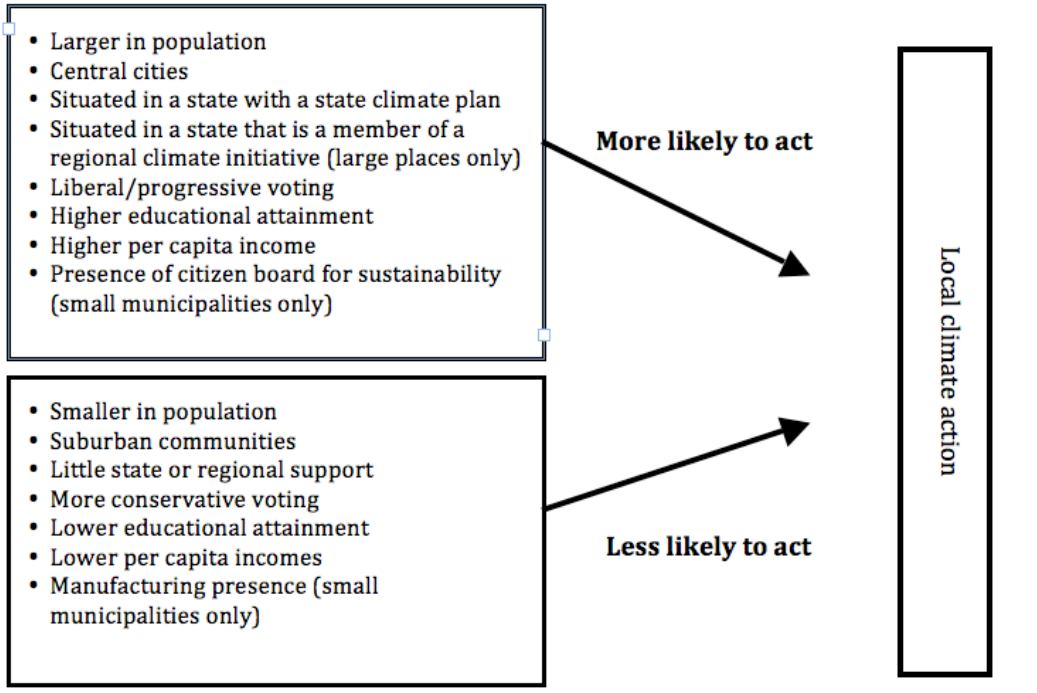
Methodology

Selection of municipalities

This study builds from a prior statistical analysis of the factors related to local government planning for climate change mitigation (Homsy, 2013) using the results of a 2010 national survey of local sustainability policy adoption (Svara, 2011). Local officials were asked

if their municipalities had undertaken a greenhouse gas inventory or set targets for emissions reductions for government operations or the community. The multilevel, logistic regression model uses the responses from 1,841 urban, suburban, and rural municipalities to examine whether certain economic, fiscal, demographic or governance factors correlate to increased or decreased likelihood of such climate change policy action. The results are summarized in Figure 5. They show that population size, liberal voting, higher education attainment, per capita income, and presence of a state plan are positively correlated with increased odds of climate change action. If the state in which a municipality sits is part of a state-to-state climate initiative (e.g. the Regional Greenhouse Gas Initiative) then the likelihood of local action increases, but only for larger cities. In small communities, economic dependence on manufacturing decreases the odds, while the presence of a citizen commission dedicated to sustainability increases them.

Figure 5 – Model of communities that undertake climate change action



(Data source: Homsy 2013)

This paper examines the regression residuals from the prior study to identify municipalities with the lowest expectation of action. From this list, I focused on those communities who acted despite the lower odds of doing so. This approach of examining deviant communities allows me to extend theoretical frameworks of policymaking into smaller municipalities, which are more typical of U.S. local governments than big cities. This analysis also provides for a more representative understanding of the challenges facing local leaders who choose to act on global commons issues. Of the 18 communities contacted, officials in 12 agreed to be interviewed, four refused outright, and two did not respond to repeated requests.

As shown in Table 4, the communities in the sample included communities in Alaska, Florida, Iowa, Michigan, Minnesota, Nebraska, New Hampshire, Ohio, Texas, Utah, and Wisconsin. (Two communities were from Wisconsin.) I did not offer confidentiality to the interview subjects, but I have not attributed particular quotes to specific people or places. Data consisted of interviews with the city manager, environmental officer, or other official as well as document data (e.g. land use or economic development plans, news reports, etc).

Table 4 – Descriptive statistics of communities

Name	State	Population	Metro status	Per capita income	Percent w/ college degree
City of Homer	Alaska	5,003	Rural	$32,035	33.7
City of South Daytona	Florida	12,252	Suburb	21,793	14.7
City of West Liberty	Iowa	3,736	Rural	16,502	17.5
City of Roseville	Michigan	47,299	Suburb	21,240	10.6
City of Sleepy Eye	Minnesota	3,599	Rural	21,883	14.7
City of Kearney	Nebraska	30,787	Rural	22,125	36.2
Town of Enfield	New Hampshire	4,582	Rural	26,871	6.2
City of Loveland	Ohio	12,081	Suburb	32,024	39.3
City of Forest Hill	Texas	12,355	Suburb	15,651	11.4
City of Hurricane	Utah	13,748	Suburb	21,650	20.5
Village of Howard	Wisconsin	17,399	Suburb	26,222	23.8
City of Columbus	Wisconsin	4,991	Rural	27,610	24.7
Sources:		2010 Census	ICMA survey	(2010 5-year American Community Survey)	

I spoke with 15 people in the 12 communities, which are briefly described below. All contacts started with the city manager as the person who would have broad knowledge of policymaking in the municipality and the power of agenda setting. Sometimes I was offered another official in lieu of or in addition to the city manager. The interviews were conducted over the phone in the fall of 2012 and lasted from 30 to 60 minutes. All interviews were recorded and professionally transcribed for coding and analysis. Interview data were supplemented by review of additional documents obtained from the interview subjects or on community websites. The quotes in this paper have been edited for clarity.

The twelve communities in the sample and their initiatives on climate change are described below.

Homer, Alaska. The coastal community sits 125 miles south of Anchorage with an economy driven by tourism and natural resources. The city drafted a climate change plan in 2007 that created a baseline inventory of emissions and set a goal of a 20 percent reduction in emissions (from 2000 levels) by 2020. The city's 2011 economic development plan specifically refers to the economic impact of the changing climate, which could be, for example, positive as temperature warms and the Alaskan growing season lengthens. Most mitigation measures are for government operations and the city received a state award for reducing energy costs at its sewage treatment plant by 20 percent. The new town center plan embraces smart growth principles and includes the installation of wind turbines. In Homer, I interviewed the city manager.

South Daytona, Florida. The mayor of South Daytona spearheaded sustainability efforts. (This mayor passed away suddenly in April 2010.) The city is the first in northern Florida to achieve a gold recognition as a green city by the Florida Green Building Coalition. One of the main challenges described in the city's 2011 sustainability plan is the threat of a 6.5 foot rise in

sea levels due to climate change. The city inventoried its emissions in 2009 and set greenhouse gas reduction goals of a 20 percent from 2008 levels by 2021 and 25 percent by 2031. In South Daytona, I interviewed the parks and recreation director and the redevelopment director.

West Liberty, Iowa. West Liberty sits halfway between Iowa City and Muscatine and is home to West Liberty Foods, a meat processing plant formed by a collaborative of turkey farmers. The majority of the population (52%) is Latino. The city has undertaken climate action due to regulation on its municipal utility. The utility produces its own power through a natural gas / diesel dual powered generator. It produced enough electricity to support the entire municipality with excess to sell back to the grid. In West Liberty, I interviewed the city manager.

Roseville, Michigan. Roseville is a blue collar, inner ring suburb of Detroit and has rapidly dropping property values. The city undertook an inventory of greenhouse gas emissions of its own operations in order to qualify for grants from the Southeast Michigan Regional Energy office. They used the funds to install energy efficient streetlights as well as to retrofit city buildings to increase energy conservation. I spoke with the recently retired city manager.

Sleepy Eye, Minnesota. Sleepy Eye has a municipally-owned utility, which produces some power and purchases the rest on the open energy market through a regional consortium. The utility is required by state law to decrease emissions by 1.5 percent annually until 2025 through energy conservation. They spend about $125,000 per year on energy saving projects throughout the municipality. They also have a renewable energy requirement that gradually increases to 25 percent by the year 2025. I spoke with the city manager and the director of public works, who oversees the municipal utility.

Kearney, Nebraska. Rising gasoline prices sparked Kearney's interest in sustainability and the city purchased an all-electric vehicle to replace a full-size pickup truck in the parks

department. The city has inventoried energy use in all municipal buildings, changed traffic lights to more energy efficient fixtures, and is upgrading streetlights. They are members of the Nebraska Clean Cities Coalition. In Kearney, I spoke with the assistant city manager.

Enfield, New Hampshire. Enfield is a largely rural community, which just installed its first stoplight. The town is adjacent to Hanover, New Hampshire, home of Dartmouth College. Enfield has an energy committee that is charged with finding ways to reduce energy costs. Their major project so far has been to audit energy use in the town hall. A new heating system saved significant money, but other projects, such as replacing the leaky windows have stalled due to costs. I spoke with the town manager and the chair of the Enfield Energy Committee.

Loveland, Ohio. Loveland is a suburban community in the Greater Cincinnati area with Ohio's first State and National Scenic River, the Little Miami, running through it. The city has adopted a sustainability policy that establishes a general goal of reducing carbon emissions, but set no specific targets. The city recently signed a letter of intent with a developer to build 92 units of energy-efficient luxury apartments on municipally-owned land that the city hopes will produce enough on-site energy for residents. The city is also discussing putting a solar array atop a capped landfill. I spoke with the city manager of Loveland.

Forest Hill, Texas. Forest Hills is a suburb of Fort Worth. Most of the city's residents (49%) are African-American and 38 percent are Latinos. The city has done the least in the sample of twelve in terms of climate change or sustainability. Their municipal master plan has a rudimentary section on energy conservation. The city has issued a permit for green residential buildings by a private developer, but the project has run into funding issues related to the bad economy. I spoke with the city manager.

Hurricane, Utah. Hurricane sits in southwestern Utah near the border with Nevada and Arizona. A conservative community, climate change action comes to the city by virtue of its ownership in a municipal utility, which is fueled by a combination of coal (41%), natural gas (44%), hydroelectric (13%) and wind (2%) at generation stations located around the region. Among the cutting-edge programs the city-owned utility allows residents to monitor their electric usage on-line and get a free energy analysis. The utility also allows net metering so that residents can install solar panels or wind turbines and sell excess power to utility. I spoke with Hurricane's city manager.

Howard, Wisconsin. Howard is a suburban community of Green Bay. The city has a citizen commission that investigates energy saving strategies for the municipality and gives awards to local businesses and organizations that green their operations. The city is seeking a developer for a dense residential development on city-owned land that takes advantage of ground source heat technology. They have an application before the state to undertake tax increment financing for the project. I spoke with the city manager.

Columbus, Wisconsin. The city of Columbus has an aggressive policy towards sustainability and energy conservation. The city applied for a grant that led to the hiring of a joint economic development and energy sustainability director. Among the city's conservation projects includes the conversion of all street lights to energy efficient LED technology, installation of charging stations for electric and hybrid vehicles in public parking lots, the purchase of three electric vehicles for the municipal fleet, and a series of incentives offered to utility customers to promote conservation. In Columbus, I spoke with both the city manager and the director of sustainability/economic development.

Results and Analysis

The data indicate that municipalities fell into two main categories with regards to climate change action. The first set have entrepreneurial leaders that initiate climate change action by shaping the local agenda and by prioritizing the local, internal benefits. The second set is pushed by external regulations imposed on their municipally-owned utilities. The local governments in each group are shown in Table 5. In this section, I first review the data results for each group and then examine the role of inter-municipal networks and citizen activism across both groups.

Table 5 – Categorization of drivers of municipal climate change action

Group 1 – Public entrepreneurship	*Group 2 – Regulation on municipal utilities*
Homer, Alaska	West Liberty, Iowa
South Daytona, Florida	Sleepy Eye, Minnesota
Roseville, Michigan	Hurricane, Utah
Kearney, Nebraska	Columbus, Wisconsin*
Enfield, New Hampshire	
Loveland, Ohio	
Forest Hills, Texas	
Columbus, Wisconsin	
Howard, Wisconsin	

* Columbus has a municipal utility, but city officials maintain that the utility acts largely as an enabler of action. Other drivers motivate the leadership to adopt sustainability policies.

Group 1 – Public entrepreneurship

In this group, elected mayors or appointed city officials initiated the development of climate change policy. In every case, the public entrepreneur links the global commons issue to another priority on the local agenda in order to reframe climate change to broaden the base of support as described by this municipal manager.

> We can hit both parties at the same time as long as we properly phrase the program. When we do talk about energy audits it's in that world where, yeah we know that this is climate change-ish, but we're really concerned about saving money and the climate change impact that this may have is the side benefit to it.

Saving money, by reducing energy consumption, is the most common local priority and was mentioned as a driver of climate action in 11 of the 12 communities. The public officials describe the need to maintain low tax rates and protect budget efficiency, either as part of their own management philosophy or at the urging of elected officials.

> I could tell you, yeah, there is a part of me who is a grandfather of three and I see that we need to do this from a moral standpoint. But from a city manager standpoint in an inner ring suburb with property values dropping 40 percent, you're looking to save a buck anywhere you can.

Most of the respondents described retrofitting municipal buildings, upgrading street and traffic lights, or purchasing fuel efficient vehicles as ways that climate change mitigation in the form of energy conservation could save money. Public officials cast all of these energy saving policies as fiscally responsible ones.

> There's a very key line in [our sustainability policy] that talks about fiscal responsibility. That was really the important piece to our community. We are fiscally conservative. That was the key point. We want to look at sustainability; we want to focus on that and we want to do it in a budget-neutral or a budget-friendly manner.

At the same time, fiscal constraints are described as the biggest barrier to local climate change action. Budgets are often the most important management tool available to local officials and provide insight into the choices made by local government leaders. Budgets and setting tax rates are an annual affair in most communities; in addition, elections take place every two to four years. Most public officials in the sample report that the cost concerns result in elected officials making short-term, locally-focused choices.

> Councils are, by nature, very conservative in regards to what they want to try unless there is almost a guarantee. They wouldn't have let me, for example, spend $135,000 [for energy efficiency] out of the capital projects

> budget at a time they are laying off people, even though it would save money on utilities down the road. Without a grant, they weren't going to do that.

This reliance on external funding raises doubts that climate change mitigation and energy conservation projects would be sustainable in the long-term. Grant monies have funded the easiest, most cost-effective projects, but they may dry up or the investments may start to reap smaller rewards in the future.

Competitive pressures for economic development that increases local tax revenues were mentioned by three managers as an important reason to undertake climate change action and it was the primary reason described by this manager.

> When I came here, economic growth had been pretty flat; they'd lost employers. One of the challenges the council gave to me is that, 'we'd like to see you go out there and see if you can turn the community around.'…
>
> [Our state] is pretty conservative. The state government doesn't give us a local option sales tax and we don't have any property tax abatement, which are tools communities have in other states… What we did was try to differentiate ourselves by using energy sustainability, the green movement, and embracing that in order to attract economic development.
>
> *Interviewer: How well has that worked?*
>
> People come to town, and the first thing we ask is, 'Why do you want to come here?' [They respond,] 'Hey, you're driving a brand new 2012 Chevy Volt, the electric car plug-in. How many communities do that?' It's makes [us] competitive and gives us a media edge or economic edge or an attitude edge over other communities.

In this case, the city manager specifically used a sustainability grant (from a utility) to hire a single point person to oversee both sustainability and economic development. The fact that it was grant money initially eased the concerns of elected officials who were hesitant to try new and costly things. In the 12 months preceding the interview, the economic/sustainability director reports recruiting $31 million dollars of private sector capital investment, including industrial, commercial, and a $5 million affordable housing complex that had considered several other

communities around the state. Other successes include finding grants to purchase a plug-in hybrid vehicle and upgrading streetlights with high efficiency lamps. The person hired for the position navigates the dual sustainability and economic development roles so well that when the initial grant ran out, the city council allocated general funds for the position.

Another official explains that their local climate change action is less about standing out from the crowd, as in the previous case, and more about meeting the minimum requirements of the high-tech companies that the municipality seeks to attract.

> Our city council has made it a policy priority to work on sustainability, primarily for economic development purposes. [We] actively recruit technology companies and that's been very important to them, to see what we're doing as a city and as a community on sustainability. We want to make sure that it's very, very visible and that we can easily show a potential investor that we are working on these issues here.
>
> *Interviewer: Have you seen any results from that yet?*
>
> Official: We have. Some smaller companies have made initial investments and we're one of two finalists for a billion dollar data center. It was very important to them to see what we were doing and how interested is the community in sustainability.

Competition for economic development is a strong internal driver among many U.S. municipalities and framing climate change action in this way can be an economic development selling point. One manager says that their sustainability agenda explains "maybe 50 percent [of our success]. I can't attribute everything to it. There's still location and there are other community attributes that attract business here."

Another internal factor mentioned by two city officials was the local impact of climate change, especially extreme weather. These impacts, particularly when the shifts affect economic activity, can create a political atmosphere conducive to climate change policymaking.

> We're concerned that we are definitely seeing changes in the climate, more frequent storms and pests, like the spruce bark beetle that haven't happened for many years, but are devastating forests around here.

This community is engaged with locally-based federal research centers about the potential impacts of sea level rise and other changes to the natural resource economic base, such as forests and fisheries, in an effort to better understand greenhouse gas emissions reduction and develop adaptation strategies. Another manager presented a broader scenario, but one in which weather changes still shaped the discourse.

> The discussion has been along these lines. We had the mildest winter in memory. There were very few snowstorms, very little snow plowing or disruption from winter weather. Then we had a drought, which is causing all kinds of issues related to the death of trees. Republicans and Democrats alike love our urban canopies. When there's discussion of climate change, it's these unseasonable seasons that we're having that make people stand up and ask, 'what's going on?'

Interestingly, many of the communities in this study experienced the drought and heat described above without generating local reaction. Local impacts related to economic development spurred more action than local impacts related to weather. Whether climate catastrophes, such as Hurricanes Katrina or Sandy, which also have enormous economic consequences, spur action is a question for future research.

Eight of the officials interviewed indicated their personal belief in the need for action on climate change as an important reason for climate change mitigation policies in their communities. Most managers describe insinuating climate issues into the policy agenda when the opportunity presents itself.

> I've always thought it was a very, very important issue. There's no doubt. When I was first hired, that wasn't the top priority on the agenda. The city council had all kinds of other things they wanted me to address and the climate change thing sort of evolved over time.

Another official attributes local climate policy to his professional ethics. "It's my personal belief and conviction that as manager, this city, and any organization that I work with, should reduce its environmental impact." This city manager takes full credit for initiating climate change policies in his community. But his enthusiasm does not give him a free hand; he must sell action to his elected officials on the basis of budget savings.

Group 2 – Municipal utility driven

In the second group of municipalities, three of the local governments act on the issue of climate change because the municipality owns an electric utility, which faced external regulation. A fourth city (Columbus, Wisconsin) had a municipal utility, which faced external regulation, but local leaders say their push for sustainability had other drivers. Some of these local utilities are power producers while others buy energy and resell it to their residents and local businesses. The role of municipally owned utilities was surprising and offers additional insights on factors that drive climate action, especially within a multilevel governance framework.

Local officials describe three roles the municipal utility play in local climate change action. The first and most important is that they are subject to regulation which forces attention to emissions and conservation. In some cases these regulations are imposed by the federal government; in others it is the state government that compelled action. One municipal manager describes federal regulations as forcing them to upgrade a power plant to reduce emissions. Another manager reports that all utilities in the state, including municipally-owned ones, must invest a certain amount of their revenue every year into energy conservation and renewable

energy efforts. Despite his strong personal belief in energy conservation, he admits, "I'll be honest. If we weren't required to do this, we wouldn't be this aggressive." One local government has to meet state requirements for green energy purchases by its municipally-owned utility.

The second role that these municipal utilities play involves providing fiscal capacity to the local government. Whether by mandate or as a local initiative, in three of the four municipalities with utilities, the excess in fees generated over production and distribution costs is used, in part, to fund energy conservation programs. Usually, the top-down regulations on the utilities did not require that specific kinds of conservation take place; the energy policies were shaped by local officials. Some local governments used the money for energy conservation efforts in municipal buildings or fleets while others sought to help local residents or businesses.

The third function of municipal utilities has been to sensitize local officials to the climate change issue.

> *Interviewer: You say you have an energy conscious council. What makes them energy conscious?*
>
> Part of it is because we are a community that has our own municipal utilities. We have a pretty progressive energy program in the state, we have goals we have to meet... It makes us all pretty conscious of those types of things. I think the council is just aware of the issues more because we have our own electric utility.

Inter-municipal networks and citizen action

Networks prove important to the public officials interviewed in both groups. Most frequently mentioned are regional and statewide networks. In one state, the alliance is among suburbs in a metropolitan area. In another, the manager reports that his staff had just returned from a conference and he expected to soon hear what his team had learned about sustainability. In another state, five municipalities created a small network dedicated to climate change. In

another, suburban communities have an association that deals with general municipal issues and the association applies for and administers grant money used by municipalities for energy conservation.

Surprisingly public officials in both groups did not see citizens or citizen activism as a major benefit or obstacle. Only one manager reported that citizens had an initiating role in climate action. In most of the interviews, citizens were not portrayed as a factor and sometimes citizen activists hindered the adoption of staff-supported climate change policies.

Instead, residents are portrayed in some communities by officials as creating an overall progressive or environmental ethic that allows local leaders to act on environmental issues without encountering much resistance. In other places, the environmental feelings are more tied to the use of nature or natural heritage.

> You don't have to drive very far until you're in nature. We have a lot of sportsmen and they actually are better stewards of the environment than a lot of people give them credit for. The responsible sportsmen are a good asset; the fishermen are a good asset.

Discussion

The results of this study support both an internal public choice theory of action and a multilevel governance one. First, policy entrepreneurs in Group 1 municipalities undertake action on global issues when it fits their local agenda. As in studies of larger places, the officials use sustainability to advance other local priorities and, in that way, broaden the coalition of supporters. Most often that local priority is cost savings although economic development is also shown to be an important internal driver for public entrepreneurs.

However, these entrepreneurial officials need outside funding to launch and sustain their efforts. Even when the policy or program offers an important co-benefit, such as fiscal savings,

officials were reluctant to invest in energy conservation and climate change action. And, most of the leaders stated that they could make few advances without outside help. The startup cost of energy conservation technology, even if there is an eventual payback, is a significant barrier to action in smaller places. Policy entrepreneurs need to find ways to make climate change a local priority, but also find sources of funding for policymaking and implementation.

Local budgets and fiscal capacity, therefore, play dual roles with regards to climate change action. The promise of cost savings and efficiencies can be a powerful instigator for a public entrepreneur. However, with community leaders reluctant to invest their own funds in energy conservation, the budget is a significant barrier. Independent action by municipalities, at least among the smaller places examined in this study, is limited by resource needs and thus action is tied to a greater network involving other government or private actors.

The municipalities in the second group, those driven by regulations on their municipal utilities, find opportunity in the multilevel governance framework. The utilities generate revenue that can be used in support of energy conservation. Public officials in these municipalities speak less about restrictions on capacity and find ways to leverage their connections to the utility. Utilities are key players in both compelling action and enabling it. Although government-owned, these utilities are market-oriented partners in a networked, multilevel governance structure that operates with different priorities than municipalities.

Another theme that emerges across both groups is the lack of a major role for citizens, who are important internal drivers in a public choice framework. This study found only one community in which citizens played an instigating role in climate action. In the eleven other municipalities citizens are barely active in the issue. Such a finding might be expected in deviant communities, by the nature of the sample. However, it remains in stark contrast to much of the

literature that emphasizes the important role of citizen activism in building and sustaining support for local issues. Citizens could play a role advocating for action, especially when the cost/benefit equation tips towards the negative and makes it harder for local managers to find support for action. Citizens might also augment the capacity of small, local governments through their work on boards or commissions (Homsy, 2013).

The lack of such activism in this study raises questions about the sustainability of staff-initiated programs and policies. One community leader describes a lessening of support for local sustainability efforts, when the mayor who initiated much of the action, passed away. Important policy goals must be institutionalized through the bureaucracy and not simply personalized through leadership (Moore, 2000). This research indicates the importance of policy entrepreneurs to initiating climate action, but leaves open the question about the longevity of such policies if popular support is not mobilized.

This study also reveals that municipal networks and professional organizations play an important role in the exchange of information among small municipalities. Much climate change research has focused on transnational networks, such as ICLEI-Local Governments for Sustainability or the U.S. Conference of Mayors, as important for knowledge transfer and political cover. However, studies indicate that such groups play a limited role in pushing climate action on to the local agenda (Bulkeley & Kern, 2006). For the public officials in this sample, regional or statewide networks serve to advance sustainability conceptually and technically with local officials reporting that regional and state conferences are an important source of information. In these networks, public officials can more likely find economically, culturally, and climatically peer communities, than if they were in a national or trans-national network. These smaller groups add capacity to local governments by writing and administering grants.

Conclusion

Public entrepreneurs, driven by internal priorities, are important to the initiation of local climate change action, but this study of unlikely pioneers indicates that significant local policymaking cannot be expected under a purely public choice framework. Those in this study that sought to go it alone needed some kind of external capacity to initiate programs – even projects with short-term financial paybacks. The role of the municipal utilities is interesting in this regard. It brings top-down regulation onto municipalities, but provides a market mechanism for funding locally-designed greenhouse gas reduction efforts. Leaders develop strategies that fit their communities culturally, economically, and politically while satisfying the external mandate. These examples show that a multilevel governance framework can compel local action and, at the same time, allow local leaders to shape climate change mitigation strategies best suited to their conditions.

This study is one of the first to examine smaller places – those municipalities where most Americans live. These policy entrepreneurs must shape climate action policies to fit a local agenda, which is often focused on saving money. The leaders in these smaller communities are sophisticated in their understanding of climate change, but push up against capacity constraints. Smaller places benefit from a multilevel governance approach in partnership with state and market actors (such as municipal utilities) which provide incentives and capacity to communities. This study demonstrates that despite the "pioneering" label, when it comes to climate change, these local governments cannot get very far on their own.

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CHAPTER FIVE

CONCLUSION

The three papers of this dissertation squarely situate the actions of local governments regarding climate change within a collaborative web. Despite popular notions of local control and the academic blind eye to state government's role in municipal policymaking, cities and towns are not lone or independent actors in the area of climate change. Chapter two of this dissertation establishes a climate change action framework in which local knowledge and policy is a crucial part of an effective co-production relationship with centralized authority. The proposition is empirically tested in chapter three with the main finding that a multilevel governance environment does enhance the odds of climate change action at the local level, especially among smaller places. Chapter four examines a subset of municipalities qualitatively and reveals the importance of entrepreneurial leadership, but also finds the capacity restrictions facing places trying to act. Taken together, my research indicates that local government can be innovative, but innovation is limited when municipalities act alone.

As discussed in chapter two, the role of higher levels of authority is not simply to impose a top-down regulatory regime on municipalities. Such an approach is too blunt to deal with the complexity of climate change action by local governments. Instead, the state and federal government play multiple roles in coordinating action, building capacity, providing expertise, and sanctioning municipalities that fail to act. Municipalities can translate centralized knowledge into policy to meet climate protection goals. The notion of coproduction of both knowledge and policy among rural communities which we began to develop in chapter two has become an important theme in my research. This collaborative approach recognizes that the vast web of

actors (public and private) across multiple levels of government dismantles traditional bureaucratic stovepipes that focus on single-issues. The multilevel governance and multi-agency collaborative approach is integral to solving complex issues and has implications beyond the rural municipalities described in the second chapter.

The statistical analysis in chapter three finds local government capacity to be significant for all cities. The public official interviews in chapter four reveal that every municipality in the sample needed outside capacity in order to undertake climate change action. Even those driven by an internal desire to reduce budgets through energy conservation used external grants or expertise to initiate action. This finding among small municipalities is consistent with previous research that even big cities engaged in climate change policymaking need outside financial support (Bulkeley & Kern, 2006; Holgate, 2007; Wang, Hawkins, Lebredo, & Berman, 2012).

The interviews with local officials in smaller communities find that cost savings is the primary driver of local climate change action, which is also the motivation found previously in big cities (Kousky & Schneider, 2003). The budget as a driver of climate action is not a surprising frame as expenditures and taxes shape local politics and officials often use the budget as a management tool. Budget efficiency is used to convince those not interested in climate change or environmental protection that climate action is warranted.

The statistical analysis in chapter three also finds that municipalities in states with climate plans had increased odds of action. These plans do not require action by local governments. Instead, as I put forth in that chapter, the presence of a state plan creates a political and technical atmosphere conducive to action. The interviews in chapter four add some detail about the role of the state in municipal action. Clearly regulations are important. Even though no state mandates municipal action, some do require greenhouse gas emissions reductions and

energy conservation by utilities, including municipally-owned ones. This has pushed municipalities to greater reductions than they would have undertaken otherwise as well as introduced and sensitized local officials to the issue. A second role for states is the potential provision of fiscal capacity. In this interview sample, state funding does not play a major role in providing capacity, but one of a number of potential sources of funding. However, that could simply be a matter of sample size and selection; further investigation in this area is warranted.

The importance of state government differs between larger and smaller places. While both benefit from being situated within a multilevel environment; state government is more important to smaller places while state-to-state regional initiatives increase the odds of action among bigger cities. Perhaps this reflects the lower need by big cities for the capacity and technical expertise that a connection to state government brings. It may also be recognition of the growing role of municipalities in a globalized world (Sassen, 2004), though that moniker is typically reserved for the biggest urban cores.

Size is not the only factor that distinguishes the ability of municipalities to act. As the results in chapter three demonstrate, central cities are twice as likely to plan for and implement climate change policies as either suburbs or rural areas, even when controlling for politics, size, state government, capacity, and other factors. Suburbs may be free riding on the knowledge and policy implementations generated in urban cores; they do not act because they do not have to. Rural places may lack the technical knowledge to pursue many policies on their own (Carter & Culp, 2010) and they may be too far away from the knowledge and activity of urban cores to benefit from spillovers. The lower results by suburbs and rural places may also result from the fact that most municipalities, especially smaller ones, simply do not have control over many sectors that contribute to climate change. For example, even if public transportation is controlled

by a state or independent agency, central cities tend to have more political influence in shaping those systems than suburban or rural communities which are party of the same system.

The enterprising nature of municipal managers and other public officials is an important driver of climate change action as described in chapter four. City staff, sometimes using strategies vetted by their professional networks, reframe policies of global import, such as climate change mitigation, to fit a local agenda, most often budget savings through energy conservation. In order to undertake these programs, the bureaucrats find themselves needing to reframe policies to fit local political circumstance. The officials also expend considerable effort finding outside funding by writing grants or redirecting utility revenues. Municipal utilities, on the other hand, bring with them external regulation to reduce greenhouse gas emissions, but also a revenue stream that can be used for conservation.

Future research

The insight that municipalities do not act alone positions my research agenda going forward. Three interesting surprises emerged in my dissertation and these form one part of my research agenda going forward. In addition, a number of questions I had early in the research, but could not answer in these this set of papers, remain. I summarize these as well.

Surprises

First, the importance of statewide and regional networks was an interesting theme that emerged from the interviews with public officials described in chapter four. Increasingly research finds that the transnational networks (such as ICLEI Local Governments for Sustainability) are ineffective at pushing climate change action beyond pioneering communities

(Bulkeley & Kern, 2006). However, many of the public officials interviewed for this dissertation found great value in regional, state, and sub-state networks. There are a number of possible reasons for this. One is that officials seek to learn from the practices of "similar" communities (Bassett & Shandas, 2010; Carter & Culp, 2010). While the climate change actions in Stockholm may be fascinating to American public officials, the governance structure, economy, politics, available capacity, and a host of other factors make the practices harder to apply in their communities. Even best practices disseminated at national level conferences might not be as applicable. In this area, I want to explore three research questions. First, I want to investigate the successes and challenges of the handful of regional climate change efforts underway in a number of metropolitan regions. Second, I want, via a survey, to examine the correlation between levels of sustainability and climate change action and membership in various local, regional, national, or international networks. Third, I already plan to explore the possibilities for a new multi-state regional governance system, which I started to outline in chapter two of this dissertation.

The second surprise results from the discrepancy between the results in chapters three and four over the role of citizens. The statistical analysis in chapter three indicates the importance of a citizen commission as well as measures of community capacity to climate change action. This finding is consistent with other studies focusing on general issues of sustainability, though unlike the ICMA survey upon which my analysis in chapter three is based, all of these other studies use proxies for citizen involvement (O'Connell, 2009; Portney, 2013; Portney & Berry, 2010; Ramírez de la Cruz, 2009; Zahran, Brody, Vedlitz, Grover, & Miller, 2008). However, only one of the public officials interviewed for chapter four described an important role for citizens. This might not be surprising as communities used in chapter four are supposed to be the 'deviant ones' that do not fit the model in chapter three. By definition, this

might account for the finding of a lower role for citizens among the communities examined in chapter four. However, the potential for a reduced policy role for citizens in smaller places fits my experience as a consultant working with local governments. Under most circumstances, elected and appointed officials drove budget and policy decisions with little to no input from the public. Public participation became a factor only around very controversial decisions. The finding of chapter four, then, raises the possibility that the role of the citizen is different in smaller places or around issues of sustainability. Both through a survey and a series of case studies, I want to investigate the role of citizens in climate change and sustainability policymaking as well as in smaller municipalities.

Third, the interviews in chapter four revealed the impact of municipal utilities and the three roles these institutions play in capacity provision, education, and implementation of state and federal mandates. This was unexpected and is rarely described in the existing literature. The role of municipal utilities and similar institutions is a compelling topic as we understand municipalities to be actors within a collaborative web. Already I have begun a case study project with a colleague at the University of Aberdeen focusing on community-owned wind projects in New York and Scotland. I have also included a question about the presence of a municipal utility on a survey about planning and the environment that is being sent to public officials in New York State cities, villages, and towns.

Other questions

First, I have a lingering question about the role of planning and comprehensive plans in the advancement of sustainability policy and climate change policy. Despite the proliferation of sustainability plans, climate change plans, and other environmental documents, the comprehensive plan (also known in different states as a ‘master plan’ or a ‘general plan’)

remains the most common document providing a vision for a community. Many municipalities engage in strategic planning, but that often focuses on local government operations and often has a shorter time frame. The first step in this project would be to analyze two sets of plans to understand the ways that municipalities integrate sustainability and climate change. The first set of plans would be a randomly drawn sample from around the country stratified by region and size. The second set would be the plans given top awards by the American Planning Association to see how sustainability and climate change may or may not be included in each.

Second, I would like to begin investigating the efficacy of municipal planning and policymaking in the area of sustainability. Are communities implementing sustainability strategies and do these strategies have the intended outcomes? While there is a growing body of research on the former, less has been undertaken on the overall impact of local sustainability policy. This is particularly important as I find that many municipalities are driven to act by cost savings, which may not materialize (Kousky & Schneider, 2003). I have started gathering national data for an examination of "best practices" in land use. My first interest is incentive zoning, which is used to push the private sector to provide public goods, such as open space, green buildings, and affordable housing. This represents a kind of governance strategy that is growing as municipalities face tighter budgets and increasingly rely on a variety of public-private relationships. Research evidence suggests this might be a successful strategy in big cities, but, as with other aspects of my research, I seek to understand whether or not incentive zoning is appropriate in smaller cities or suburban areas.

Third, sustainability raises questions about the ability of municipalities to navigate the "sustainability triangle" of economic, environmental and equity concerns (Campbell, 1996). Sustainability's requirement to balance environment, economy, and social equity offers a

possible operating framework for local governance going forward in the 21st century (Fiorino, 2010). In a paper not included in this dissertation, Mildred Warner and I find that environmental protection and economic development are not mutually exclusive; although the challenge of bridging equity and the environment remains (Homsy & Warner, 2013). Poor people often bear the brunt of environmental degradation in the siting of polluting or hazardous facilities (Bullard & Johnson, 2000). The ability of local governments to engage all three factors will be an important project in the sustainability field.

Final thoughts

The impetus for this research started on the ground. As a practicing planner, I worked with small cities, villages, and towns throughout New York State as they wrestled with issues of environmental and economic sustainability. I have had many successes among my clients. I have been a part of and witnessed local government innovation first hand. But two main frustrations always nagged at me as a planner and eventually drove my research agenda. First, the municipalities in which I worked always planned alone, ignoring neighboring governments. Also, many of the best practices available to professionals, especially in terms of environmental sustainability and climate change, came from big cities. I knew and my clients knew that many of the lessons simply would not translate.

Through this research, I have been able to situate the municipality – not as a lone actor, but as one piece of a partnership. Other members of the collaboration include higher levels of government, citizens, nongovernmental organizations and businesses, and other municipalities. This is a reality that our focus on localism and public choice models of planning and policymaking keeps hidden, both to local government planners (such as me at the time) and to many researchers investigating urban policy. My research builds on the foundation of others who

understand that the competitive, non-cooperative nature of many municipal relationships is counterproductive on both environmental and economic issues.

I have also been able to uncover important similarities and differences between large communities and smaller ones around climate change and sustainability. Previous studies only hinted at the importance of examining municipal actions by size. Eventually, as my research agenda continues to unfold, I believe this will be an area where I will make an important policy contribution. Those seeking to influence the actions of local governments will have a more realistic picture of the circumstance in which municipalities act.

Finally, I see the value of focusing on the power of coproduction relationships, both as a theoretical framework governing my research and as an overriding policy approach. Governance in the United States is a federalist venture, which should be the basis for a collaboration. In the area of climate change, local innovations and policy perspectives are crucial, but they must be undertaken within a multilevel structure that provides incentives, goals, technical expertise, and capacity. As with so many other aspects of society, saving the planet from climate change will not come from the actions of isolated actors, but from the vast majority pushing – in their own way – towards a common goal.

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